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No. 14, Original

In the Supreme Court of the United States

OCTOBER TERM, 1930

THE UNITED STATES OF AMERICA, PLAINTIFF

v.

THE STATE OF UTAH, DEFENDANT

BRIEF FOR THE UNITED STATES OF AMERICA

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In the Supreme Court of the United States

OCTOBER TERM, 1930

NO. 14, ORIGINAL

THE UNITED STATES OF AMERICA, PLAINTIFF

v.

THE STATE OF UTAH, DEFENDANT

BRIEF FOR THE UNITED STATES OF AMERICA

JURISDICTION

Inasmuch as this suit is brought by the United States against the State of Utah, the law is well settled that the suit is within the original jurisdiction of this Court. Master's Report, page 9.

STATEMENT

By leave of Court, the United States filed its bill of complaint in this Court on April 9, 1928, the defendant State filed its answer on October 10, 1928.

The purpose of this suit is to quiet the title of the United States to certain portions of river beds of the Green, Colorado, and San Juan Rivers within the State of Utah, as follows:

The Green River, from a point where the river crosses the township line between townships 23 and 24, S., R. 17, East (approximately the mouth of the

San Rafael River), to its confluence with the Colorado River, 95 miles;

The Colorado River from the mouth of Castle Creek (14 miles above the town of Moab, Utah), to the Arizona-Utah boundary line, 296 miles; that section of the Colorado River, above the mouth of the Green River, was formerly known as the Grand River;

The San Juan River from the mouth of Chinle Creek (5 miles below the town of Bluff, Utah), to its confluence with the Colorado River, 133 miles.

The United States is the riparian owner of all the lands on both sides of said rivers except those shown in Exhibit A, attached to the Bill of Complaint.

The State of Utah was a part of the lands acquired from Mexico at the conclusion of the war with Mexico. See the following treaties: Guadalupe Hidalgo, February 2, 1848 (9 Stat. 922); Gadsden Purchase, December 30, 1853 (10 Stat. 1031).

Utah became a State on January 4, 1896. If the rivers in question were not navigable at that time, the title to their beds did not pass to Utah upon its admission, but remained in the United States, the riparian owner. If the rivers were navigable at that time, the title to the river beds passed to the State.

The United States, by virtue of its claim of ownership has granted many oil and gas permits to lands in said river beds and the permittees have actually entered into possession thereof under said permits, and have spent large sums of money in exploring for

oil and gas. Also many mining locations have been made in the river beds.

The State of Utah, in pursuance of its assertion of ownership has, during the past few years, granted oil and gas leases to certain portions of the beds of the rivers, and in the year 1927 passed a Legislative Act declaring the rivers to be navigable. (See Laws of Utah, 1927, page 8, Brief, page 94.)

By order duly entered March 11, 1929, Charles Warren, of Washington, D. C., was appointed Special Master with the powers of a Master in Chancery, to take the evidence and to report the same to this Court, with the findings of fact, conclusions of law, and recommendations for a decree, all subject to examination, consideration, approval, modification, or other disposal, by this Court.

The Master filed his report herein on the 15th day of October, 1930. The Master (M. R. 182) found the Green River, the Colorado (Grand) River from Castle Creek to the Junction with the Green, and the Colorado River from Mile 176 above Lees Ferry to the Utah-Arizona boundary to be susceptible to navigation. To these findings the Government filed exceptions. The section of the Colorado from the Junction with the Green to Mile 176, the Master found to be not susceptible to navigation. To this finding Utah filed exceptions. The Master found the San Juan River to be not susceptible to navigation. To this finding neither party filed exceptions.

The case is now here on exceptions to the Master's Report.

Such additional evidence to the Master's Report as is pertinent to a decision upon the law and the facts, will be set forth in the brief and appendix.

THE PLEADINGS

The Master has set forth the gist of the Pleadings on pages 5 to 8, inclusive, of his Report.

SUMMARY OF THE ARGUMENT

The State of Utah was admitted into the Union on January 4, 1896. (29 Stat. 876.) The title to the river bed is determined as of that date. In conformity with the constitutional principle of State equality, the title to the beds of the rivers within the State passed to the State, if the rivers were navigable, as of that date, provided the beds had not already been disposed of by the United States. If the rivers were not then navigable, the title to the beds remained in the United States. (See page 7, this brief.)

The question whether the rivers were navigable is to be determined according to the general rule recognized and applied in the Federal Courts. (See page 7, this brief.)

In determining the issue of navigability, the history of a river as to early use by fur traders, emigrants, merchants, etc., is entitled to great weight. The San Juan, Green, and Colorado Rivers, in Utah, were not used by the pioneers as highways for transportation or travel. Such lack of use in the days of difficult overland travel is weighty evidence of the

nonnavigability of the rivers. The head of navigation of the Colorado River was far below Lees Ferry, Arizona. (See page 8, this brief.)

The physical characteristics of a river must be considered in determining its navigability. These rivers can not be used as highways of commerce within the State of Utah. During most months of the year their stream flow changes greatly from day to day; they carry a large amount of sand and silt which form sand bars, and the tortuous courses of the rivers and their changing velocity and volume cause the bars to change in size and shape from day to day. Because of these and other conditions these streams are not navigable within the State of Utah. (See page 52, this brief.)

Rivers, which are classed as navigable rivers, are those which are used or are capable or susceptible to being used as highways of commerce. Boating in these rivers in Utah has always been difficult due to the physical characteristics of the river. No merchant in any town on or near these rivers has ever used them for the purpose of transportation. Such use as has been made of the rivers has been confined principally to small boats and rafts of miners, prospectors, explorers, and engineers. Commercial experiments with larger boats have failed because of inability to cope with natural river conditions. At the time of trial there were no boats in operation on any of the rivers in Utah.

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By Executive Order dated May 17, 1884, President Arthur set aside certain lands, a part of which were in Southern Utah, as a reservation for Indian purposes. This Order described one course as running to the middle of the channel of the Colorado River, and thence up and along the middle channel of the Colorado and San Juan Rivers. The Order includes all of the San Juan River involved in this suit, and that part of the Colorado River between the mouth of the San Juan and the Utah-Arizona Boundary Line.

The natural inference is that the Executive made the reservation extend to the middle channel of the rivers because the rivers were not navigable. (See page 90, this brief.)

Since the admission of Utah to the Union, many mining locations have been made in the beds of the rivers under the Placer Mining Laws of the United States. The United States has also granted permits to drill for oil and gas in the beds of the rivers. Lands adjacent to the rivers have been withdrawn by Executive Order for power site and irrigation purposes. All of these acts have been done, without objection on the part of the State of Utah, until the inception of this litigation. While it is true that non-action on the part of Utah is not conclusive against navigability, nevertheless it is evidence to be considered with the other facts and circumstances in this case. (See page 91, this brief.)

ARGUMENT

I

THE TITLE TO THE RIVER BEDS IS DETERMINED AS OF THE DATE OF STATEHOOD.

The State of Utah was admitted into the Union on January 4, 1896 (29 Stat. 876). In conformity with the constitutional principle of equality of States, the title to the beds of rivers within the State passed to the State, if the rivers were navigable, as of that date, provided the beds had not already been disposed of by the United States; if the rivers were not then navigable, the title to the beds remains in the United States. *United States* v. *Holt State Bank*, 270 U. S. 49, 55; *Oklahoma* v. *Texas*, 258 U. S. 574, 583. *Brewer Elliott Oil & Gas Co.* v. *United States*, 260 U. S. 77, 88. (M. R. 10.)

II

IN DETERMINING WHETHER OR NOT THE RIVERS IN QUESTION ARE NAVIGABLE, THE RULE OF NAVIGABILITY AS ANNOUNCED BY THE FEDERAL COURTS IS CONTROLLING

This Court has held navigability, where the basis of the right is one arising under the laws of the United States, is a federal question to be determined according to the rule recognized and applied in the Federal Courts.

United States v. *Holt State Bank*, 270 U. S. 49, 55, 56.

See also, *Economy Light & Power Company* v. *United States*, 256 U. S. 113; *Brewer-Elliott Oil & Gas Co.* v. *United States*, 260 U. S. 77, 89.

It is true that the State of Utah passed an Act in 1927 entitled "The Colorado River in Utah and the

Green River in Utah declared to be navigable streams." See Laws of Utah, 1927, page 8, this brief, page 94.

This law was passed some thirty years after the admission of Utah to the Union and can have no retroactive effect. The State courts have not been called upon to pass upon the navigability of the rivers in question. The status of the title to the river beds was fixed as of the date of admission, January 4, 1896. The Master correctly concluded (see page 16 of his report) that this law can have no effect upon the title of the United States.

III

EARLY NAVIGATION

The Colorado River above Lees Ferry, Arizona, and the Green River, have no history of early navigation. The head of navigation on the Colorado River is far below Lees Ferry, Arizona

(Exceptions 3, 7, 8)

Before the country was settled there were but few overland routes. Explorers, fur traders, merchants and emigrants used rivers as highways for trade and travel whenever possible. This Court has, therefore, given serious consideration to the methods of early transportation in determining the navigability of a river. In *The Montello*, 20 Wall. 430 and *Economy Light & Power Co. v. United States*, 256 U. S. 113, the Court based its decisions largely upon early navigation. In the former case it said (20 Wall. 440):

> It is true, without the improvements by locks, canals, and dams, Fox River, through

> its entire length, could not be navigated by steamboats or sail vessels, but it is equally true that it formed, in connection with the Wisconsin, one of the earliest and most important channels of communication between the Upper Mississippi and the lakes. It was this route which Marquette and Joliet took in 1673 on their voyage to discover the Mississippi; and the immense fur trade of the Northwest was carried over it for more than a century.

The Court also quoted (p. 440) from Smith, History of Wisconsin (Vol. I, page 81) as follows:

> At this time (1718) the three great avenues from the St. Lawrence to the Mississippi were, one by the way of the Fox and Wisconsin Rivers, one by the way of Chicago, and one by the way of the Miami of the Lakes, when, after crossing the portage of three leagues over the summit level, a shallow stream led into the Wabash and Ohio.

In *Economy Light & Power Co.* v. *United States*, 256 U. S., 113, navigability of the Desplaines River was under consideration. The opinion pointed out that as early as 1675 there was the use of the rivers by fur traders (page 117):

> But both courts found that in its natural state the river was navigable in fact, and that it was actually used for the purposes of navigation and trading in the customary way, and with the kinds of craft ordinarily in use for that purpose on rivers of the United States, from early fur-trading days (about

> 1675) down to the end of the first quarter of the nineteenth century. * * * During the period mentioned the fur trade was a leading branch of commerce in the western territory, and it was regularly conducted upon the Desplaines River. Supplies in large quantity and variety, needed by the early settlers, also were transported over this route between Chicago and St. Louis, and other points. Canoes and other boats of various kinds were employed, having light draft but capable of carrying several tons each, and manned by crews of six or eight men. The route was navigated by the American Fur Company regularly during a period of years down to about 1825, after which it was disused because the trade had receded to interior portions of Illinois that could be reached more conveniently with horses.

The opinion of the Circuit Court of Appeals in *Economy Light & Power Company* v. *United States*, 256 Fed. 792, 798, discusses the early navigation of the Desplaines River in even greater detail.

In contradistinction to the above cases, no such extensive early use appears in the *Red River case*, *Oklahoma* v. *Texas*, 258 U. S. 574; or in *Brewer-Elliott Oil & Gas Company* v. *United States*, 260 U. S. 77, in which the streams were held to be non-navigable.

An inquiry, therefore, into the ancient and early uses of the Green and Colorado Rivers becomes pertinent.

Indians and cliff dwellers

(M. R. 26, Exception 7)

Practically every river in the United States which is navigable has a history of early navigation which antedates the coming of the white man. This is true of the Hudson, the Ohio, the Missouri, the Columbia, and many others.

The history of the world demonstrates that wherever rivers are suitable for the operation of boats, primitive man has used them for that purpose. (Lewis R. Freeman, Abs. R. Vol. 1, pp. 661–668.) The method of navigation used by the Indians in the United States ranged from the birch bark canoe used by the northern Indians to the log dug-outs used by the Indians of the Southern States. (Bureau of American Ethnology, Bulletin No. 30, Vol. 1, p. 156.)

The inhabitants of the lower regions of the Colorado River used a crude reed boat or raft for the purpose of crossing the river. (See "The Colorado River," page 13, by Freeman, Compl. Exhibit 81; "The Romance of the Colorado River," page 30, by Dellenbaugh, Compl. Exhibit 13.)

It seems certain that no Indian ever attempted to operate a boat on the section of the Colorado River above the Grand Canyon, or upon the Green River. No relics have been found which indicated that the Indians or Cliff Dwellers used boats. When Major Powell entered upon his first expedition in 1869 and his second expedition in 1871, no Indian

guides were available who knew anything about the river. Freeman (Abs. R. Vol. 1, p. 668).

The Navajo Indians inhabited that part of Utah bordering on the San Juan and Colorado rivers. They were skillful artisans. They were masters of design, weavers, and workers in silver. (Bureau of American Ethnology, Bulletin No. 30, Vol. 2, p. 40.). They made no boats. They used none, except in recent years as ferries to cross to trading posts. Indians in other parts of the United States far less advanced than the Navajos used boats when living near rivers susceptible of navigation. The fact that the Navajos did not use boats upon the rivers in question is evidence against navigability. (Dellenbaugh Abs. R. Vol. 1, p. 444.)

Expedition of Padre Francisco Escalante (M. R. 27) and the Old Spanish Trail

In the year 1776 Escalante set out from Santa Fe, New Mexico, to seek a route to Monterey, California. (Freeman, Compl. Exhibit 81, p. 29.) Santa Fe was the most important Spanish town north of the Rio Grande; Monterey was the most important Spanish town in California.

Escalante crossed the San Juan River near where it first meets the north line of New Mexico. From this point he proceeded northward and crossed the Grand or the Colorado River near the mouth of the Little Dolores; thence northwesterly and crossed the Green River near the foot of Split Mountain Canyon, Utah. From there he moved southwesterly to a point in the neighborhood of the Virgin River, then

turned easterly and eventually crossed the Colorado River, at a point designated as the Crossing of the Fathers, and returned to Sante Fe, New Mexico. (Dellenbaugh Abs. R. Vol. 1, p. 445.)

The prime object of the expedition was to establish a highway for trade and travel between Santa Fe, New Mexico, and the California Spanish towns. The Spaniards were experienced explorers and were builders of empires. They were skilled in the operation of boats. After Escalante's expedition an overland trade route from Santa Fe to California was established, known as the Old Spanish Trail.

Between the point where the Old Spanish Trail crosses the San Juan River and the mouth of the Virgin River there were 700 miles of continuous river, and the Spaniards discarded the river route as one adaptable for travel. The trail crossed the Grand (Colorado) River near the present town of Moab and from the point where it crossed to the mouth of the Virgin River there were 600 miles of continuous river. This river also was discarded as a means of travel. The trail crossed the Green River at the present town of Greenriver, Utah, and from this point to the mouth of the Virgin River there were 660 miles of continuous river. The river route was again discarded.

From the Green River Crossing, the trail proceeded overland to a point near the mouth of the Virgin River through a country which was rough, broken, and barren and offered obstacles to overland travel unequaled in any section of the United States. (See

Compl. Exhibit 221.) The route could not be traveled by wagons. All freight was transported by pack animals.

Subsequent to Escalante's explorations, Wolfskill, Jedadiah Smith, and others used the overland route from Santa Fe, New Mexico, to Monterey and the other Spanish towns in California. For fifty years a substantial trade was carried on by this route. History does not disclose that any person ever attempted to operate boats upon any of the three rivers for the purpose of traveling or transporting goods between Santa Fe, New Mexico, and California.

The Old Spanish Trail appears upon all of the old maps. (See Compl. Exhibit 54; Dellenbaugh, Abs. R. Vol. 1, p. 446; Compl. Exhibit 14, page 95.)

Hispanic American Historical Review, Vol. IV, No. 3, August, 1921.

The Master has indicated (See Exception 7) that the rivers were in his opinion not usable in connection with the trade on the Spanish Trail. The point where the Spanish Trail crossed the Virgin River was only a few miles from the Colorado River. River transportation from any of the crossings of the Trail on the upper rivers would have eliminated miles of hard overland travel. It was the custom of the pioneers to travel the easiest way, and when the rivers were not used, that fact is evidence of lack of navigability.

The fur traders in Utah

(Exception 8)

The fur trader played an important part in the exploration and the civilization of the western country. For decades his business was first in size in the West.

The fur-trading business necessarily carried the trader into the wildest parts of the United States. The success of the fur trade depended largely upon transportation. It was necessary for the fur trader to bring in his articles of trade and, as exchanges were made, to transport his furs out of the wilderness.

In every section of the country, each large river played its part in the fur trade. The fur traders, by Durham boats, by flatboats, and by canoes, traveled the Mississippi, the Missouri, the Ohio, the Fox, the Wisconsin, the Desplaines, and the Columbia rivers. Each of those rivers was recognized as an important link in transportation between civilization and the fur-producing wilderness. The Colorado, the San Juan, and the Green rivers were never so used.

The history of the Columbia River was otherwise. (See The History of the American Fur Trade of the Far West, Chittenden, Vol. 2, page 790.):

> In spite of its many rapids and the difficult portages at the Dalles and Cascades, boats were the universal means of transportation during the fur trade era from the mouth to the source of the Columbia. The lighter craft ascended the tributaries for long distances, and if the total navigable length of all these streams, as actually used by the traders, could be deter-

mined, it would be found to amount to more than two thousand miles.

As early as 1825 General Henry Ashley established fur-trading posts at several points on the Green River above Greenriver, Utah. Ashley was at the head of one of the largest fur companies in North America. His operations were comparable with those of the Hudson Bay Company.

Ashley attempted a boating expedition upon the Green River, and that for only a few miles. Had the Green River been a navigable stream Ashley would undoubtedly have transported his furs by way of the Green River and the Colorado River to the Gulf of Lower California and from there by ships to the New York or the London markets. Instead of doing so he and other fur traders chose in preference to transport their fur across the Rocky Mountains to the Missouri River and from there to the City of St. Louis, from which point their furs eventually reached the eastern markets.

(See Dellenbaugh, Compl. Exhibit 13, page 108; Freeman, Compl. Exhibit 81, page 82.)

> It was the trader and trapper who first explored and established the routes of travel which are now and always will be, the avenues of commerce in that region. (P. 9, Preface to The American Fur Trade of the Far West by Hiram Martin Chittenden. Francis P. Harper, N. Y., 1902.)

The Master's conclusion (M. R. p. 51) is that there existed a belief in some quarters that the rivers

were nonnavigable. Nonuse by the fur traders must be counted against the navigability of the rivers.

In additional historical discussions of these rivers in the Master's Report, pages 25 to 52, one thought predominates: No historian, trapper, engineer, or explorer suggests any use of the rivers in Utah as a means of transportation.

The Mormons

(M. R. 47)

In the year 1847 the Mormons settled in the vicinity of the Great Salt Lake. Almost immediately the church leaders commenced the establishment of the towns, known technically in church history as "stakes," in southern Utah in the vicinity of the Colorado River.

The Mormon settlements in Utah were separated from the then outposts of civilization on the Missouri River by fifteen hundred miles of hard, tedious travel over plains, deserts, and mountains. Travellers over this route were constantly beset by hostile Indians. During the early years of the Mormon settlements it was necessary for them to obtain their supplies by this overland route. Their numbers were constantly being increased by converts made in the eastern part of the United States and in many of the European countries. Under the plan of the church, it was contemplated that all of these converts should eventually come to Utah for the purpose of becom-

ing permanent residents. To the Mormon, therefore, the problem of transportation was of vast importance.

The records of the church disclose that after the year 1847 there was considerable travel between Salt Lake City, Utah, and California. The road to California started at Salt Lake City, and went down through central Utah and swung west and passed out of Utah near the Virgin River. The road was a long, hard trip, which was attended by considerable difficulty on account of the rough, barren, uneven country through which it passed.

Several roads led from Salt Lake City to various points on the Green River. A road led from Salt Lake City across the Green River at Gunnison's Crossing, which is the present site of Greenriver, Utah. There was another road which led from Salt Lake City to the mouth of the Uinta River. It was at that point that Major Powell, on his second expedition, left his party and went to Salt Lake City. (Dellenbaugh, Compl. Exhibit 14, pp. 66 and 67.) The road from Salt Lake City, which crossed at Gunnison's Crossing, was traveled by the Mormons in their settlement of Moab in the year 1855. (See Compl. Exhibit 625.)

The most authentic history of the use of these roads is found in the records of the Mormon Church. The pertinent excerpts were collected by Mr. Dellenbaugh and are found in Compl. Exhibits 621, 622, 623, 624, and 626.

In addition to the through travel between Salt Lake City and California, it was necessary for the Mormons

to maintain communications with their settlements in southern Utah. The aforementioned exhibits disclose that the Mormon Church never at any time used the Green or the Colorado Rivers in Utah for the purpose of trade and travel.

The records of the Church also disclose that as early as 1855 the Church was interested in the possibilities of the Colorado River for the purpose of navigation. Compl. Exhibit 626 of the records of the Las Vegas Mission, pp. 3, 4: An exploring party reported that they found the nearest point of the river to be about twenty-eight miles from Las Vegas; that they had traveled down the stream for two days, but found nothing but barren deserts and high mountains, the river running through deep canyons, making it impossible to decide upon the navigation of the stream with certainty.

In Compl. Exhibit 626, page 3, of the Church records of the St. George Stake, the following appears:

> Commenced the return journey. Passed Major Blake and his command, camped at the "Sugar Loaf." He informed the company that the expedition to explore the Colorado had been perfectly successful; that there were three steamers on the river; that another of five feet draught was to be placed in it in a short time; that they had ascended to within 70 miles of the mouth of the Virgin, and that they expected to be able to reach its mouth with vessels of that draught. He also hinted that some troops might be sent up that way.

Compl. Exhibit 624, page 11. The year 1864 discloses that the leading merchants of Salt Lake City formed a company for the purpose of building a warehouse on the Colorado River at Callville and for the purpose of bringing goods into Utah by way of the river. It is pointed out that Mormon immigration might come into Utah by the same route. (The warehouse was located later at the town of Callville 35 miles below the mouth of the Virgin River.

Later in the year (Compl. Exhibit 624, page 11), under the direction of President Brigham Young, a landing and site for a church warehouse was selected on the Colorado River 125 miles from St. George (Callville).

The record also recites that it was contemplated to have the church immigration from Europe come to Utah via Panama and the Gulf of Mexico and up the Colorado River to this landing Callville as the *highest practicable head of navigation on the river.*

The same record discloses that freight rates were quoted from California, via the Colorado River to Hardy Landing on the Colorado. (About 150 miles below Callville.)

Compl. Exhibit 624, page 12: In 1865 the records of the Church speak of the operation of a flat-bottomed barge, 50 feet long and 8 feet wide, propelled by the aid of poles, oars, and a sail, which traveled from Hardyville to Call's Landing.

Also, certain suggestions are made with reference to the improvement of the river as far as Call's Landing and possible schedules for sailing,

including a regular freight line from New York to the mouth of the Colorado and thence to El Dorado Canyon (Callville).

In Compl. Exhibit 624, page 13, the report on possible navigation of the Colorado River continues and definite rates and times of sailing from New York City to Callville are quoted.

In February 1865, the Church storehouse at Callville was built.

In all the history of this State there is no suggestion of any navigation on the Colorado River above Call's Landing. That point seems to be definitely accepted by the Mormons as the highest possible point of navigation.

In Compl. Exhibit 624, page 14, the establishment of a coach road from the Colorado River to Salt Lake City is discussed, but there is no suggestion of operating any boats above Call's Landing.

In Compl. Exhibit 622, page 6, report is made of the steamer which is expected to arrive to bring roofing, pitch, etc., to be used in connection with the construction of the warehouse at Callville and also contains the following significant observation:

> Should the European saints at some future time come to this route, they will, in a few days' travel, be in the midst of our settlements.

The possibilities of the use of the Colorado River below Callville as an artery of commerce is fully discussed in a letter written to the Editor of the

Salt Lake City Daily Telegraph March 14, 1865. (See Compl. Exhibit 623, pp. 3, 4, and 5.)

A discussion of the navigability of the Colorado River was made the subject of an editorial comment in the Deseret News, March 29, 1865. (See pages 5 and 6, Compl. Exhibit 623.)

The question was further discussed in the Milennial Star, published at Salt Lake City, March 30, 1865. (See Compl. Exhibit 623, page 6.)

The necessity of opening the Colorado River for navigation is summed up in the document heretofore referred to, appearing in the Daily Telegraph in these words:

> The farmers of this territory will always find a splendid market for all they can raise, and the goods necessary for them can be purchased far cheaper than at the most favorable seasons when goods could be brought over the plains by the long and expensive route heretofore taken from the Missouri River.

The quotation from the above newspaper shows that the people of Utah, and especially the merchants of Salt Lake City, knew the Colorado River and knew the advantages of a water route into Utah.

If the Colorado River above Callville or the Green River had possessed any possibilities as a navigable stream, the people of Utah certainly would have discovered them. The water route, if the rivers were navigable, would have been continued up the Colorado River to the nearest point of contact with Salt Lake City, which would have been less than 150 miles away.

A settlement expedition to the San Juan country was organized at Cedar City and an appropriation of $5,000 was secured from the Legislature to build a road into the San Juan country. The church also made an appropriation for the same purpose. (Compl. Exhibit 620, page 5.)

The expedition had a row boat which was launched on the Colorado River in the neighborhood of Hole-in-the-Rock. It is recorded that the boat was stuck in some shallow rapids and it was neither possible to float down nor to row up the river and the boat was abandoned. (Compl. Exhibit 626, page 6.) After the advance expedition had reached the vicinity of Bluff, several of the members started back to Hole-in-the-Rock on New Year's day, 1880. (Compl. Exhibit 620, page 12.) The return to Hole-in-the-Rock was entirely overland.

Nonsettlement of eastern Utah, as found by the Master (M. R., p. 51), is not the reason the rivers were not used. The above records disclose that the Mormons were constantly engaged in the work of exploration. Means of transportation were of paramount importance. Nonuser of the rivers in Utah by them again must be counted as evidence against navigability of the Utah sections of the rivers.

Expedition of Lt. Joseph C. Ives, 1857 and 1858

(Exception 3)

In 1857, the Secretary of War directed Lt. Joseph C. Ives to explore the Colorado River. The purposes of the expedition are set forth in the re-

port of Lt. Ives. (Compl. Exhibit 72, 36th Cong., 1st Sess., House Exec. Doc. 90.)

At page 21 he states:

> The establishment of new military posts in New Mexico and Utah made it also desirable to ascertain how far the river was navigable, and whether it might not prove an avenue for the economical transportation of supplies to the newly occupied stations.

Also on the same page he states:

> To ascertain how far the river was navigable for steamboats being the point of primary importance, it was necessary first to make provision for this portion of the work.

Lt. Ives' expedition reached the foot of Black Canyon on March 12th, 1858. At this point the water became very shoal and numerous rapids were encountered.

He makes this observation in fixing the head of navigation:

> It appears, therefore, that the foot of Black Canyon 356 miles below Lees Ferry should be considered the practical head of navigation, and I concluded to have a reconnaissance made to connect that point with the Mormon road and let this finish the exploration of the navigable portion of the Colorado.

Expedition of Lieutenant George M. Wheeler, 1871

Lieutenant Wheeler, United States Topographical Engineer, conducted an expedition up the Colorado River in 1871. He reports on the head of *improved* navigation as follows:

One of the results of the river exploration has been to determine the absolute limit of navigation, a question not settled by the exploration of Ives, as a steamer ascended the river to a point (Callville) a short distance beyond the uppermost point reached by him in his boat. This limit is the foot of the Grand Canyon, or near the crossing of 1871.

It is certain that at no stage of water could steamers reach this point unless the *channel shall be improved by the removal of sunken rocks;* but no unsurmountable obstacles of this nature exist. The farthest *practical head of improved navigation* must remain permanently at the foot of Grand Canyon. (Italics not in text.)

The exploration of the Colorado River may now be considered complete. Its course has been traced from its mouth to the junction of the Green and Grand, and the positions of incoming tributaries noted. The greater part of the basins of the Grand and Green have undergone quite thorough exploration and survey during the past ten years as well as much of the Great Colorado Plateau that borders the river in the vicinity of the great canyons.[1]

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[1] (Report upon United States Geological Survey West of the One Hundredth Meridian, Capt. Geo. M. Wheeler, Washington, Government Printing Office, 1889, Compl. Exhibit 73.) (Freeman, Compl. Exhibit 81, Chapter XI, p. 252;) (Dellenbaugh, Compl. Exhibit 13, Chapter XII, p. 294.)

Stanton survey, 1889–1890

(M. R., p. 57, Exception 11)

During the period May 25, 1889, to March 24, 1890, Robert B. Stanton, Chief Engineer of the Denver, Colorado, Canyon and Pacific Railroad Company, made a survey of the Green and Colorado Rivers from Greenriver, Utah, to Needles, California, for the purpose of determining the feasibility and cost of building a railroad paralleling the river through the canyon. (Survey Compl. Exhibit 175.) It is significant that throughout the canyon section his location contemplated the "stealing from the river," or, in other words, the construction of a roadbed on material blasted into the river channel. (Field Notes, Compl. Exhibit 175, Labyrinth Canyon notes of May 25, 1889; Stillwater Canyon notes of May 29; Cataract Canyon notes of June 14; Narrow Canyon notes of June 22; Glen Canyon notes, June 29, December 27.) As soon, however, as he reached the section of the river below the Grand Canyon he realized that the method of construction used above would interfere with navigation, and we find in his field notes (Compl. Exhibit 175) March 19, 1890:

> On account of steamboat navigation it would, perhaps, be best to tunnel through two points * * * (Mile 334 below Lees Ferry.) March 20, 1890, in Black Canyon (Mile 352 below Lees Ferry) * * * this piece of work (railroad location) is very difficult and would be very expensive on

account of keeping the river clear for navigation.

And again:

> There would be no difficulty here, except for keeping the narrow channel open for navigation.

Stanton without a doubt was a competent engineer, thoroughly familiar with problems of transportation. He had personally been over every foot of the Green and Colorado Rivers below Greenriver, Utah. Above the Grand Canyon he saw no navigable possibilities, present or future, because his plan of railroad construction in that section contemplated a permanent roadbed built upon material blasted into the river.

Stanton's field notes (Compl. Exhibit 176) of his expedition were kept with meticulous care from day to day. They are a model of engineering detail. The experience of this expedition, as recorded by Stanton in the field, demonstrates the absolute unfitness of the Green and Colorado Rivers above the Grand Canyon as highways of commerce.

Nims, Kane, Edwards, and MacDonald, survivors of the Stanton expedition, were witnesses, and their oral testimony corroborates Stanton's field notes.[2]

Stanton's subsequent actions support the conclusions drawn from his field notes.

[2] Nims, (Abs. R. Vol. 1, p. 401); Kane (Abs. R. Vol. 1, p. 587); Edwards (Abs. R. Vol. 1, p. 555); McDonald (Abs. R. Vol. 1, p. 604). (See Photos, Compl. Exhibits 179 to 220; Compl. Exhibits 174, 177, 178.)

On his second expedition, his boats and supplies were shipped by rail to Greenriver, Utah. He did not launch his boats at Greenriver, but hauled them overland via Hanksville, Utah, and launched them on the Colorado River at Crescent Creek. (Edwards Abs. R. Vol. 1, pp. 555–556).

In 1899 when he was engaged in placer mining in Glen Canyon, he shipped a big launch to Flagstaff by rail and thence overland to Lees Ferry and had it and three other boats rowed and towed upstream to Hite. (McDonald, Abs. R. Vol. 1, p. 611.)

In 1899 when he was constructing a large dredge on the Colorado River, he actually built a road in to the river and hauled tons of machinery to the river overland from Greenriver, Utah. (McDonald, Abs. R. Vol. 1, p. 611.)

Stanton knew the rivers in Utah from experience, and his failure to use them for transportation leads to but one conclusion—not navigable.

Small boats and rafts on the Grand (Colorado) River

Information concerning any early navigation upon the Grand is meager.

Freeman records Samuel Adams traveled the Grand River in 1869. "The Colorado River" (Compl. Exh. 81, Chapter IX, p. 201).

Kendrick surveyed Stanton's Railroad from Grand Junction, Colo., to the Junction with the Green River in 1889. "The Colorado River" (Compl. Exh. 81, p. 294).

Kane was on the Grand in 1888 in a raft. (Abs. R. Vol. 1, p. 587, and McDonald in 1887 (Abs. R. Vol. 1, p. 605).

The experience of these persons on the river suggest no possibilities of use of this section of the river as a highway of commerce.

The Powell expeditions (1869, 1871)

The expeditions of Major J. W. Powell of 1869 and 1871 descended the Green and Colorado Rivers from Green River, Wyoming. The first expedition ended at the mouth of the Virgin River; the second at the mouth of the Kanab. The reports of these expeditions are complete. The personnel of the expeditions included geologists, engineers, and topographers. At no place in the diaries of the members of the expeditions or in the official reports is there any suggestion indicating navigable possibilities of the rivers in Utah. On the contrary, the progress of the expedition was so impeded by rapids and sand bars, that the conclusion is nonnavigability.[3]

Best expedition of 1891

J. B. Best was in charge of prospecting party which left Greenriver, Utah, July 10, 1891. The boats

[3] Powell, Compl. Exh. 51; Dellenbaugh, *The Romance of the Colorado River*. Compl. Exh. 13; Dellenbaugh, *A Canyon Voyage*, Compl. Exh. 14; Dellenbaugh (Abs. R. Vol. 1, p. 425); Thompson, Diary, Compl. Exh. 627; Jones, Diary, Compl. Exh. 628; Bishop, Diary, Compl. Exh. 629.

used and the experience of the party were similar to those of the Stanton party.[4]

The steamer "The Major Powell" (1891)

(M. R. 58, Exceptions 12, 49)

In the year 1891, a steamboat was launched at Greenriver, Utah, known as *The Major Powell.* (Photo. Compl. Exhs. 474, 475, 476.) The boat was run down the river as far as Wheeler's Ranch, about 20 miles below Greenriver, Utah, and there abandoned by the owners. (Abs. R. vol. 1, p. 566.)

In the spring of 1893, William H. Edwards and some associates leased this boat from the owners for the purpose of taking tourists down the river. The boat was approximately 35 feet long, 8-foot beam, and drew 18 inches of water (Abs. R. vol. 1, p. 566), and was equipped with an upright boiler with two 6 HP. engines connected to twin screws.

Mr. Edwards and his associates made the necessary repairs upon the boat, and, in the month of April, 1893 (Abs. R. vol. 1, pp. 567–568), started down the river on a trial trip. Mr. Edwards was an experienced riverman. In order to assist them in the operation of the boat on the return trip and upon other trips, Edwards made marks upon the canyon walls to indicate the points where bad sand bars and other obstructions might be encountered. (Abs. R. vol. 1, p. 568.)

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[4] Edwards (Abs. R. vol. 1, p. 555); Kane (Abs. R. vol. 1, p. 589); McDonald (Abs. R. vol. 1, p. 610); Photos. Compl. Exhibits 222 to 262.

The boat was equipped with a block and tackle for the purpose of assisting it off sand bars by making a line fast to the shore. (Abs. R. vol. 1, p. 568.)

The boat encountered numerous sand bars on the down trip and finally reached a point about a quarter of a mile above the first rapid in Cataract Canyon. At this point the boat turned around and returned to Wheeler's Ranch.

The trip upstream was not quite as difficult as the one downstream, because in many cases the boat could be backed off the sand bars. (Abs. R. vol. 1, p. 568.) The boat was tied up at Wheeler's Ranch, and no attempt was made to take it into the town of Greenriver, because, as described by Edwards, he "did not think it possible to get it (the boat) up there; too much rock and rough water." (Abs. R. vol. 1, p. 569.)

A second trip was made down the river about ten days later and practically the same difficulties were encountered as upon the first trip. Edwards testified (Abs. vol. 1, p. 569) that while the river was higher on the second trip, it had shifted the bars so that neither the markings nor the information gathered upon the first trip was of much assistance to him in operating the boat.

On the second trip, the boat again returned to Wheeler's Ranch (Abs. R. vol. 1, p. 570) and was tied and abandoned there. The engines and boilers on the boat were taken off and used in connection with a plant at Greenriver, Utah. The hull of the boat was abandoned. (Abs. R. vol. 1, p. 570.)

The history of this boat is important on the question of navigation because it was an enterprise undertaken commercially and at the instance of the Rio Grande Western Railroad. (Abs. R. vol. 1, p. 570.) It was the first and only attempt to operate commercially upon the Green River, prior to the admission of Utah as a state. The experiment resulted in failure and the failure was due principally to the physical characteristics of the river.

Placer miners in Glen Canyon prior to 1896

For approximately 7 or 8 years prior to 1896, placer mining was carried on in Glen Canyon. A post office was established at Hite, Utah, on the Colorado River at the mouth of North Wash in 1889. (Abs. R. vol. 2, p. 904.) All of the mails and supplies were brought in overland via Hanksville. Greenriver, Utah, was nearest the railroad connection. These placer miners used flat-bottomed rowboats frequently to take supplies a few miles down the river from Hite. On trips down the river considerable difficulty was encountered with rapids and sand bars. The upstream trips were accomplished only by rowing and towing. The physical characteristics of the river and the method of operation of boats during this period are described by Homer J. Hite (Abs. R. vol. 2, p. 902); John P. Hite (Abs. R. vol. 2, p. 912); Lou M. Chaffin (Abs. R. vol. 2, p. 845).

Homer J. Hite describes (Abs. R. Vol. 2, p. 903) a raft loaded with mining machinery which was taken from Hite to Ticaboo Bar, 18 miles. It was necessary to wait for high water before starting the raft.

The population of the canyon was small and probably never at any time exceeded 100.

The use of boats by the placer miners was a temporary expedient. It was neither substantial nor permanent. The operation of boats and rafts was hazardous. It never at any time rose to the dignity of commercial navigation.

Edwards' Dredge

In the year 1895 William H. Edwards was placed in charge of a dredge located on the Green River eight miles below the town of Greenriver. All of the machinery for this outfit, consisting of a good many tons, was brought down overland on the west side of the river. The dredge was set up on the east side of the river, and all of the machinery was forded across the river in the months of September and October. The dredge consisted of two 100-horsepower boilers, a steam engine, and electric generator. The boilers consumed from 5 to 8 tons of coal per day, which was all brought down by wagon overland from Greenriver, Utah. Coal is a commodity which is easily transported on water on scows. Edwards knew the river and this no doubt was the reason he preferred overland transportation.

Conclusion

This completes the history of boats on the rivers in Utah prior to 1896. In the early days of Utah, the demand for cheap transportation existed. Freight and passengers were ready to travel the

river if travel were possible. The hardships of overland travel were stupendous. The roads were rough, the country barren, and both travelers and animals suffered from heat and thirst. In the parts of the United States where none of these hardships existed, rivers were used for trade and travel. Even necessity could not transform the Green, Colorado, and San Juan in Utah into highways of commerce over which trade and travel of the early days could pass in the customary modes. Such nonuser must be construed as convincing evidence of nonnavigability. (Exceptions 7 and 8.)

Compare with *United States* v. *Holt State Bank*, 270 U. S. 49, 57, where waterway was used because it was more dependable than the overland travel.

IV

THE LAW DEFINING NAVIGABLE RIVERS

The law as to what constitutes a navigable river is simply stated in the case of *The Daniel Ball*, 10 Wall. 557–563, in this language:

> Those rivers must be regarded as public navigable rivers in law which are navigable in fact. And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary conditions, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water.

This rule is reiterated in practically the same language in the later cases. When the character of the rivers, the history and the extent of navigation in the

decided cases are analyzed, little difficulty is found in applying the rule to the facts involved in this case.

The *Daniel Ball Case, supra*, dealt with the question whether or not a steamer operated on the Grand River, between the cities of Grand Rapids and Grand Haven, Michigan, used for transportation of merchandise and passengers between those places, was subject to inspection and license laws of the United States. The ultimate question was whether or not the Grand River was navigable water of the United States. The conceded facts show that the steamer in question was one of 123 tons burden. Other evidence of the navigability of the river does not appear in the opinion, but it is a matter within the judicial knowledge of this Court that the Grand River, at least as far as Grand Rapids, Michigan, had been used for many years as a highway of commerce, over which substantial commercial trade and travel were carried on.

The question of navigability was next before this Court in connection with the Fox River, in the State of Wisconsin (See *The Montello* 11. Wall. 411–414).

The *Montello* was again before this Court (See *The Montello,* 20 Wall. 430, 441–442). This case involved the liability of the owner of a steamer, operated on the Fox River in the State of Wisconsin, between Oshkosh and Portage City, and engaged in the transportation of passengers and merchandise to procure a Federal license. On the second appeal, it appeared that the Fox River had for a period of almost 200 years been one of the important highways between the East and the West, and during

that period of time had been traveled by Durham boats and later by steamboats. This Court said, at page 443:

> * * * It has always been navigable in fact, and not only capable of use, but actually used as a highway for commerce, in the only mode in which commerce could be conducted before the navigation of the river was improved. Since this was done, the valuable trade prosecuted on the river, by the agency of steam, has become of national importance.

The case of *Packer* v. *Bird*, 137 U. S. 661, involved the title rights of certain riparian owners to the Sacramento River, in California. In its statement of facts, the Court says, at page 662:

> The River Sacramento is navigable from its mouth, or outlet, to a point above the premises in controversy. Indeed, it is one of the great rivers of the State, and is navigable over 250 miles.

Other facts as to the navigability of this river do not appear in its opinion, but it is undoubtedly true that the Sacramento River, as a highway of commerce, played an important part in the development of the State of California. The supplies for the early miners were taken in to the gold mines by this river. The rule announced in the *Daniel Ball, supra*, was reiterated in this case, at page 667. The dominant thought as expressed in the opinion as to what constitutes navigability in law and in fact, is susceptibility of a river to use as a highway of commerce.

St. Anthony Falls Water Power Company v. *Board of Water Commissioners*, 168 U. S. 349, was a case involving the rights of certain riparian owners near St. Anthony Falls, bordering on the Mississippi River. The evidence indicates that for a short distance below and above St. Anthony Falls, the river was navigable, in its natural state. This Court does state: "Preliminarily, it may be said that the Mississippi River at the point in question is a navigable stream." (Page 359) An Act of Congress on February 26, 1857, c. 60, paragraph 2 (11 Stat. 166), constituted the Mississippi River a common highway for the inhabitants of the State and other citizens of the United States. The Mississippi River, like the Sacramento River, and other large rivers of the United States will be judicially noticed as a navigable river.

The case of *United States* v. *Cress*, 243 U. S. 316, involved certain suits brought in the District Court against the United States, to recover compensation for the taking of lands and water rights for the improvement of the Cumberland and Kentucky Rivers, in the State of Kentucky, in aid of navigation upon these rivers. The evidence of the actual navigability of these rivers is not included in the opinion; but considering the part that the Cumberland and Kentucky Rivers have played in the history of this country, no evidence would be necessary to sustain their character as highways of commerce. In this case this Court quoted at length from *The Montello* decision. The following language from that decision is especially pertinent (page 324):

> There are but few of our fresh-water rivers which did not originally present serious obstructions to an uninterrupted navigation. In some cases, like the Fox River, they may be so great while they last as to prevent the use of the best instrumentalities for carrying on commerce, but *the vital and essential point is whether the natural navigation of the river* is such that it affords a channel for useful commerce. If this be so the river is navigable in fact, although its navigation may be encompassed with difficulties by reason of natural barriers, such as rapids and sand bars.

It will be observed that in quoting from *The Montello case*, this Court italicized the words "The vital and essential point is whether the natural navigation of the river" and, continuing, "is such that it affords a channel for useful commerce."

The case of *Economy Light and Power Company* v. *United States*, 256 U. S. 113, involved the Desplaines River in Illinois. As to the navigability of this river, this Court at page 117 said:

> * * * During the period mentioned the fur trade was a leading branch of commerce in the western territory, and it was regularly conducted upon the Desplaines River. Supplies in large quantity and variety, needed by the early settlers, also were transported over this route between Chicago and St. Louis and other points. Canoes and other boats of various kinds were employed, having light draft but capable of carrying several tons each, and manned by crews of six or eight men.

The case of *United States* v. *Holt State Bank*, 270 U. S. 49, involved the question of navigability of Mud Lake in Marshall County, Minnesota. The extent of the use of this Lake for the purposes of navigation and its connection with other lakes and rivers as a highway of commerce is set forth by this Court at pages 56–57 in the following language:

> * * * Mud River traversed it in such way that it might well be characterized as an enlarged section of that stream. Early settlers and visitors in that vicinity used the river and lake as a route of travel, employing the small boats of the period for the purpose. The country about had been a part of the bed of the glacial Lake Agassiz and was still swampy, so that waterways were the only dependable routes for trade and travel. Mud River after passing through the lake connected at Thief River with a navigable route extending westward to the Red River of the North and thence northward into the British possessions. Merchants in the settlements at Liner and Grygla, which were several miles up Mud River from the lake, used the river and lake in sending for and bringing in their supplies. True, the navigation was limited, but this is because trade and travel in that vicinity were limited.

This Court concluded in accordance with the approved rule that the lake was navigable. The rule of navigability as stated by the Court (p. 56) is as follows:

> The rule long since approved by this Court in applying the Constitution and laws of the

> United States is that streams or lakes which are navigable in fact * * * when they are used or are susceptible of being used, in their natural and ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water; and further that navigability does not depend on the particular mode in which such use is or may be had—whether by steamboats, sailing vessels or flatboats—nor on an absence of occasional difficulties in navigation, but on the fact, if it be a fact, that the stream in its natural and ordinary condition affords a channel for useful commerce.

A more detailed summary of navigation upon Mud Lake taken from the record on file in this Court is found in an Appendix to this brief, page 198.

The foregoing cases are practically all of the leading cases where the navigability of a stream or a lake has been sustained by this Court. It will be observed that in all of these cases there had been for a period of many years a substantial commerce carried on by the use of boats, i. e., highways of commerce.

The discussion is continued with reference to the leading cases in which this Court found that the uses of rivers fell short of the approved rule of navigability.

The case of *United States* v. *Rio Grande Dam and Irrigation Company*, 174 U. S., 690, involved a proceeding by the United States to restrain the defendant from constructing a dam across the Rio Grande

River, in the territory of New Mexico, and appropriating the waters of that stream for the purposes of irrigation. The bill averred that the building of the dam would interfere with navigation on the lower reaches of the river. The extent of the navigability of the River in New Mexico is set forth by this Court, at page 698, in the following language:

> * * * The mere fact that logs, poles and rafts are floated down a stream occasionally and in times of high-water does not make it a navigable river. It was said in *The Montello*, 20 Wall. 430, 439, "that those rivers must be regarded as public navigable rivers in law which are navigable in fact. And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water." And again (p. 442): "It is not, however," as Chief Justice Shaw said, 21 Pickering 344, "every small creek in which a fishing skiff or gunning canoe can be made to float at high water which is deemed navigable, but, in order to give it the character of a navigable stream, it must be generally and commonly useful to some purpose of trade or agriculture."
>
> Obviously, the Rio Grande within the limits of New Mexico is not a stream over which in its ordinary condition trade and travel can be conducted in the customary modes of trade and travel on water.

It was not a highway of commerce.

Leovy vs. *United States*, 177 U. S. 621, was a criminal prosecution against the defendant for building a dam, without permission of the Secretary of War, across a stream known as Red Pass, alleged to be navigable waters of the United States.

As to the extent of navigability on the Red Pass, the Court says (p. 627) as follows:

> As respects navigation through Red Pass, there was some evidence, on the part of the government, that small luggers or yawls, chiefly used by fishermen to carry oysters to and from their beds, sometimes went through this pass; but it was not shown that passengers were ever carried through it, or that freight destined for any other State than Louisiana, or, indeed, destined for any market in Louisiana, was ever, much less habitually, carried through it.

At the conclusion of the trial this Court instructed the jury, in part, as follows (p. 632):

> What is a navigable water of the United States? * * * But, if from the water in one State you can travel by water continuously to another State, and the water is a navigable water, then it is a navigable stream of the United States. * * * If it was navigable, and connected with waters that permitted a journey to another State, then it is a navigable water of the United States * * *.
>
> * * * * *

> We also think that these instructions are open to the further criticism that they contain no reference to the nature or extent of the traffic or trade carried on in Red Pass before the erection of the dam. Indeed, the charge necessarily implies that the defendant was guilty if there was merely a capacity for passing from Red Pass into the Mississippi River on any sort of a boat. Very different was the view expressed by Chief Justice Shaw when he said it is not "every small creek in which a fishing skiff or gunning canoe can be made to float at high water, which is deemed navigable, but in order to give it the character of a navigable stream, it must be generally and commonly useful to some purpose of trade or agriculture." (21 Pick. 344.)

Donnelly v. *The United States*, 228 U. S. 708, involved the validity of the conviction of a white man for the murder of an Indian on the Klamath River. It was asserted that the crime was committed on a navigable stream and that the State Court and not the Federal Court had jurisdiction.

The extent of the navigability of the Klamath River is set forth on page 709, in the following language:

> As the opinion points out, there was evidence tending to show that the stream is navigable in fact at certain seasons from Requa (near its mouth) up to and above the *locus in quo*. But the evidence was by no means conclusive. It showed an apparently

> irregular traffic, in times of high water only, employing Indian canoes, "dug-outs" and at certain times small steamboats and gasoline launches. In this state of the evidence, the trial court could not, nor can we, take judicial notice of the stream as being navigable in fact; especially in the face of a declaration by the legislature of the State that it is not navigable.

A previous opinion in this case is reported in 228 U. S. 243.

In *Harrison* v. *Fite*, 148 Fed. 781, 784, the Circuit Court of Appeals for the Eighth Circuit, speaking through Judge Hook, said:

> * * * Mere depth of water, without profitable utility, will not render a watercourse navigable in the legal sense, so as to subject it to public servitude, nor will the fact that it is sufficient for pleasure boating or to enable hunters or fishermen to float their skiffs or canoes. To be navigable a watercourse must have a useful capacity as a public highway of transportation.

Of the evidence the court said (p. 787):

> * * * Witnesses testified that in times of high water there had been no successful navigation of it in recent years, except with a gasoline launch drawing but a few inches of water, and with canoes, skiffs, and dugouts of the hunters and fishermen; that it is not being used to float the products of the fields and forest to market, and can not be profitably and successfully used for that purpose.

The stream was held not navigable.

The evidence in that case disclosed that the river had been used by duck hunters, by licensed steamboats, lumber and log rafts, and by merchants. See Appendix to this brief page 201.

In the case of *North American Dredging Co.* v. *Mintzer*, 245 Fed. 297, the Court of Appeals for the Ninth Circuit, in declaring the nonnavigability of the San Pedro Canal, cited with approval the above quotation from the case of *Harrison* v. *Fite*. The Court of Appeals adopted the findings of the District Court on the question of fact, and these are set forth in *Mintzer* v. *North American Dredging Co.*, 242 Fed. 553. It appears in that case that the particular channel in question was never used or regarded as navigable for any species of water craft other than for duck boats and punts for hunting and fishing (*id.* p. 557). However, some of the property adjacent thereto had been acquired by the Standard Oil Company and on a few occasions power boats and scows of light draft were taken up through the San Pablo Creek or Canal and entered this channel on flood tide carrying supplies to the Standard Oil Company, but it was found that, excepting periods of high tide, it was impracticable to use the channel for navigation without deepening it.

The Circuit Court of Appeals for the Sixth Circuit, in the case of *Toledo Liberal Shooting Company* v. *Erie Shooting Club*, 90 Fed. 680, speaking through Circuit Judge Lurton, and concurred in by Circuit Judge Taft, said (page 682):

> At no time is the greater part of this marsh susceptible of supporting "com-

merce" in any reasonable sense of the term. That the water stands permanently, and that it has a deep opening into Lake Erie, does not establish that this shallow body of water is capable of sustaining commerce, or is burdened with a public use. It is nothing more or less than a marsh opening into the lake. To be navigable in law, it must be navigable in fact; that is, capable of being used by the public as a highway for the transportation of commerce.

None of the characteristics of commercial navigability are shown here. It is the natural feeding ground of the duck and other waterfowl. In their pursuit by canoe and flat-bottomed ducking boats the water may be navigated. That is not commerce, and proves nothing. The same test would convert every pond and swamp capable of floating a boat into a navigable stream or lake. This bay is not a highway, never has been, and never can be. At the common law the term "navigable" had a technical meaning and was applied to all streams or bodies of water in which the tide ebbed and flowed. All such waters were public. That definition is not applicable in this country, and all waters are held navigable in law, and subject to a public use, which are by their character capable of use as highways; for purposes useful to trade or agriculture. It is the capability of being navigated for useful purposes, which is the test.

See Appendix to this brief, page 203, for boats operated on the waters in question.

In the case of *Gulf & I. Railway Company of Texas* v. *Davis*, 26 F. (2d) 930 (Affirmed, 31 Fed. (2d) 109), the court had under consideration the navigability of a stream known as Mud Bayou. In arriving at the conclusion that the bayou was nonnavigable, the court at page 934 said:

> The application of this point of view to this case makes its solution easy. There has not been, and is not now, any commerce upon Mud Bayou. No stretch of the most vivid imagination can envision conditions under which it will be in its natural state an aid to commerce.

In that case it was admitted that there had been no navigation upon Mud Bayou, but it was also admitted that boats of light draft could conduct commerce over it, should there be a commercial demand.

In the case of *Oklahoma* v. *Texas*, 258 U. S., 574, the navigability of the Red River between Oklahoma and Texas was before the this Court. This Court reached the conclusion that the river was nonnavigable, saying, at page 591:

> We conclude that no part of the river within Oklahoma is navigable and therefore that the title to the bed did not pass to the State on its admission into the Union.

There had been some sporadic attempts to navigate the Red River commercially and these are set forth at page 589 of the opinion:

> Lanesport, Arkansas, which is near the Oklahoma boundary, has been the usual head

> of navigation; but for several years before railroads were extended into that section, boats of light draft carried merchandise up the river to the mouth of the Kiamitia and other points in that vicinity and took out cotton and other products on the return trip. This occurred only in periods of high water, and was accomplished under difficulties. In very exceptional instances boats went to the mouth of the Washita, where some had to await the high water of the next season before they could return. When the railroads were constructed this high water or flood navigation ceased. That was between 1875 and 1880.

Additional information as to the kind, character, and purpose of boats actually used on the Red River has been digested from the abstract of the record and is set forth in pages 187–196 of Appendix to this brief.

A practical commercial use for navigation as distinguished from a theoretical or an exceptional use, impressed this Court as a test of navigability (*id.* page 591):

> While the evidence relating to the part of the river in the eastern half of the State is not so conclusive against navigability as that relating to the western section, we think it establishes that trade and travel neither do nor can move over that part of the river, in its natural and ordinary condition, according to the modes of trade and travel customary on water;—in other words, that it is neither used, nor susceptible of being used, in its

> natural and ordinary condition as a highway for commerce. Its characteristics are such that its use for transportation has been and must be exceptional and confined to the irregular and short periods of temporary high water. A greater capacity for practical and beneficial use in commerce is essential to establish navigability.

This case is important in determining the issue of navigability in the case now before the Court because the Red River has physical characteristics, which impede navigation, similar although in a lesser degree, to those of the Colorado, Green, and San Juan Rivers, and for the further reason that the attempts at navigation and actual navigation upon the Red River far exceeded anything which has ever been done, attempted, or hoped for on the Green, Colorado, and San Juan Rivers in Utah.

In the case of *Brewer-Elliott Oil Co.* v. *United States*, 260 U. S. 77, this Court had under consideration the navigability of the Arkansas River. In deciding that the Arkansas River was not navigable in Oklahoma above the Grand River, this Court said at page 86:

> A navigable river in this country is one which is used, or is susceptible of being used in its ordinary condition, as a highway for commerce over which trade and travel are or may be conducted in the customary modes of trade and travel on water. It does not depend upon the mode by which commerce is conducted upon it, whether by steamers, sail-

ing vessels, or flat boats, nor upon the difficulties attending navigation, but upon the fact whether the river in its natural state is such that it affords a channel for useful commerce.

The attempts to navigate the Arkansas River are set out in more detail in the opinion of the District Court. (See *United States* v. *Brewer-Elliott Oil Co.*, 249 Fed. 609, 619.) Other attempts at navigation have been digested from the record and printed in the Appendix to this brief, pages 196–198.

The physical characteristics of the Arkansas River are not unlike those of the Red River.

Summary of the law of navigability

From the above cases the following general conclusions may be drawn, which will serve as a guide for the consideration of the evidence in this case with reference to the physical characteristics of the rivers and the extent of the use of boats.

1. The rule of navigability for rivers, as announced by this Court, is the same whether the question is one of navigable waters of the United States, as appears in the cases of *The Montello, The Daniel Ball, Leovy v. United States, supra*, or one of title as appears in *United States* v. *Holt State Bank; Brewer Elliott Oil Company* v. *United States; Oklahoma* v. *Texas, supra.*

This Court has cited the cases interchangeably, without distinction when the issue was navigability.

2. No lake or stream has been declared navigable by this Court unless it appeared from the evidence

that the stream or the lake had actually supported a substantial water-borne commerce. *The Daniel Ball, The Montello, Economy Light and Power Company* v. *the United States, St. Anthony Falls Water Power Company* v. *The Board of Water Commissioners, supra.*

The outstanding thought in all of these cases was the use of the stream or lake as a highway of commerce.

3. In all cases coming before this Court, in which the question of navigability was an issue, there was evidence of varying degrees of actual operation of boats both privately and for profit. *Oklahoma* v. *Texas, Brewer-Elliott Oil Company* v. *United States, United States* v. *Rio Grande Dam and Irrigation Company, Leovy* v. *United States, supra.*

This Court has never held that the mere operation of small boats although commercially in some cases was sufficient evidence to constitute the rivers as highways of commerce.

Decisions of the United States Circuit Courts of Appeal and of the United States District Courts are to the same effect: *Harrison* v. *Fite, North American Dredging Company* v. *Mintzer, Toledo Liberal Shooting Company* v. *Erie Shooting Club, Gulf and I. Railway Company* v. *Davis, supra; Gratz* v. *McKee* 270 Fed. 719.

4. Physical characteristics of a river which prevent practical use for substantial commerce are given great weight on the question of navigability. *Brewer-Elliott Oil and Gas Company* v. *United States, Okla-*

homa v. *Texas, United States* v. *Rio Grande Dam and Irrigation Company, supra.*

The Government asserts that the Green and Colorado Rivers in Utah possess physical characteristics which have prevented these rivers, in the State of Utah, from being used as highways of commerce, in the past and will prevent such use in the future, and that the operation of boats upon these rivers has been of a minor character, attended by such difficulties arising from the natural condition of the rivers, that nonnavigability is established.

V

PHYSICAL CHARACTERISTICS

(A) Navigability of a river in law is predicated upon navigability in fact, and, in order to determine navigability in fact, the physical characteristics of the river must be considered

(B) The physical characteristics of the Green, Colorado, and San Juan Rivers within the State of Utah are such that in their natural and ordinary condition they never have in the past been and never will in the future be used as highways of commerce

Navigability in fact must be tested by the use or the susceptibility of use of the river as a *highway of commerce.* All of the cases limit navigability in fact and hence navigability in law to those streams which in their ordinary condition may be termed *highways of commerce* over which trade and travel are or may be conducted in the customary modes of trade and travel on water. This limitation excludes unusual or exceptional modes of trade and travel. If, therefore, the physical characteristics of a river are such that

these requirements can not be met, the river is not navigable. Natural obstructions may interfere with navigation and prevent a river from being used as a highway of commerce as for instance erratic or undependable stream flow; excessive quantities of sand and silt and other materials in suspension; steep gradients which produce high velocities of stream flow; many rapids; sand bars; shifting channels; sinuosity of the channel; and terrain immediately adjacent to the river of a character which permits a rapid run-off from rains and thereby subjects the river to sudden and unusual floods.

See the consideration given to such obstructions by this Court in *Oklahoma* v. *Texas*, 258 U. S. 574, 587, 589. See also *Brewer Elliott Oil & Gas Co.* v. *United States*, 260 U. S. 77 at page 86, the finding of the Circuit Court of Appeals, and of the District Court, 270 Fed. 100 and 249 Fed. 609, 619, respectively.

Some of the natural obstructions on the Green and Colorado River in Utah are as follows:

Logs and débris (Appendix to brief p. 100, Exception 21) are a hazard to the operation of boats during high water months of Spring and early Summer, and during the occasional floods of late Summer and early Fall. Ice (Appendix to brief p. 101, Exception 22) closes the rivers for practically 100 days of nearly every year. Floods during the Spring run-off (Appendix to brief p. 116) from May 1 to July 15, and during occasional storm floods of August and September (Appendix to brief p. 116, Exceptions 51, 53) produces high water, accompanied by rapid velocities

with sudden changes (Appendix to brief p. 119, Exception 33) in the water level. Sand and sediment (Appendix to brief p. 132, Exception 23) combined with the tortuous course of the river (Appendix to brief p. 99) and the erratic stream flow produce a succession of sand bars which shift with the water level. Depths (Appendix to brief p. 121, Exceptions 34, 36, 60) over the sand bars are so shallow that boats with a draft of less than 12 inches frequently ground. The channel of the river is unstable (Appendix to brief p. 135, Exception 38) and shifts from side to side. Rapids and riffles are found between Greenriver and the mouth of the San Rafael (Appendix to brief p. 105), between Castle Creek and Moab, and between Mile 176 and the Utah-Arizona Line (Appendix to brief p. 108, Exception 64).

Consideration of this evidence we believe will lead inevitably to the conclusion that the Utah Rivers are nonnavigable, within the repeated rule of this Court, merely because of their physical characteristics.

In the case now before this Court, both expert and lay witnesses testified as to the physical characteristics of the rivers in question.

See Exceptions Green 51, 52, 70; Colorado (Grand) 53, 54, 71; Colorado 67, 68, 69, 72.

In considering the physical obstructions to navigation the Master compared the sand bars in the Utah Rivers with the portages in *The Montello case*, and the *Economy Light & Power case, supra* (M. R. 97, Exceptions 34, 35, 36.) In each of these cases when the portage was accomplished or the falls passed, there

was open water either above or below. On the Utah rivers, the sand bars were continuous. See *Oklahoma* v. *Texas*. It was barely possible for small boats to get through the rivers, but merely getting through does not prove a practical use of the rivers for the purpose of transportation.

The characteristics of these rivers in Utah are such that neither Richardson nor Colonel Dent, who are shown to be familiar with river systems throughout the United States, know of any other comparable rivers. (Abs. R. Vol. 1, p. 328; Vol. 2, p. 929.) The characteristics are plainly such that the use of the rivers in Utah in the past for purposes of boating has been exceptional, unusual, and confined to irregular periods. Those same characteristics will prevent future navigation. "A greater capacity for practical and beneficial use in commerce is essential to establish navigability." *Oklahoma* v. *Texas*, 258 U. S. 574, 591.

VI

COMMERCIAL EXPERIMENTS AND MINOR BOATS

Boating experiences on the Green, Colorado, and San Juan Rivers demonstrate that these rivers in Utah possess none of the attributes of highways of commerce

(Exceptions 33 and 45)

These physical obstructions which prevent these rivers from meeting the test of navigability are not mere geographical data. They have confronted and repelled repeated but occasional efforts of men to travel on these rivers in small boats. The actual experience of men with boats upon the rivers completes the picture of nonnavigability.

The commercial experiments on these rivers have been few. There were none prior to statehood, except the *Major Powell*. (Brief, p. 30.)

The *Undine* was launched in 1901. (M. R. 60, 117, Exceptions 13, 49.) It made only two trips and was wrecked upon the riffles above Moab. With a draft of only 12 or 14 inches it was unable to avoid sand bars. When operating during high water the pilot was unable to hold the boat in the channel. A more detailed statement, R. Vol. 24, p. 4210.

The *City of Moab* (M. R. 62, 117, Exception 49) made its appearance in 1905 for tourist purposes, backed by adequate capital. The experiment was preceded by a survey of the river for commercial possibilities. The boat drew between 12 and 24 inches. Its experience with the sand bars, current, etc., was similar to the *Undine*. It took five days to make the trip from Greenriver to the mouth of the Green, 120 miles. (R. Vol. 4, pp. 737–740.)

Changes were made in the *City of Moab*, and it was renamed the *Cliff Dweller*. With a draft of only 20 inches, it had trouble with groundings on sand-bars and riffles. It made only one trip and on the return was tied at Halvorson's ranch because it could not ascend the riffles above the mouth of the San Rafael. After this trip the *Cliff Dweller* was dismantled.

These were the major commercial attempts on the Green. Failure, due to river conditions, is evidence against navigability. Increasing the power of the boats would not have made the boats suc-

cessful because that would have increased the draft. One of the principal difficulties of the boats was with groundings on bars and riffles. A river, which is so shallow in places that boats 12 to 24 inches draft frequently ground, can not have practical utility as a highway of commerce.

Yokey (M. R. 61, 62. Exception 14) tried the river with several different boats for pleasure, and hunting. He was on the river for twenty-five years, and never was able to successfully locate channels nor was he able to avoid groundings on sand bars. His largest boat, *The Black Eagle*, on its first trip blew a boiler tube due to the muddy water and the boat was abandoned. He was familiar with the rivers between Greenriver and Moab, and the lack of success of his boats was due to river troubles. (Appendix to brief p. 157.)

Thomas G. Wimmer (M. R. 66, 68, 69, 70, Exception 17), formerly a citizen of Greenriver, Utah, experimented with boats upon the Green and the Colorado (Grand) Rivers. Mr. Wimmer asserted that he was always able to locate a channel in the river, and in this respect he differs from many of the other witnesses. Wimmer took supplies down to his own ranch at times, and also took down hunting parties, prospectors, etc. Wimmer had trouble with ice, and frequently he ran into braided channels. When using an outboard motor he had it hinged so that when bottom was struck in the shallow water the motor could be raised and the boat released. Wimmer was content to let the other occupants of

the boats get into the water and push off the sand bar, although he did occasionally do so himself. His boat, the *Marguerite* was abandoned, and Wimmer has left Greenriver. The *Marguerite* only drew 2½ feet loaded. He found river navigation unprofitable and impractical. (Abs. R. Vol. 2, pp. 1196, 1207, 1210, 1214, 1222.)

Edwin J. Wolverton operated three boats upon the river. (M. R. 61, 65; Exception 15.) The stern wheeler *Wilmot*, after a few trips, was abandoned and allowed to rot. The engine was removed from the *Colorado* and the hull was used as a scow. He later built the *Navajo*, which, after a few trips, was abandoned. Mr. Wolverton claims to have been able to locate the channel. Nevertheless, in a written statement (Compl. Exhibit 633) he sums up his river experiments in these words: "The rivers indicated are not navigable on a commercial basis, but under stress of necessity certain stretches may be negotiated with light-draft boats of certain types." (Abs. R. Vol. 2, p. 1373.)

Henry E. Blake (M. R. 65, 66, 71; Exception 16) experimented with the river commercially, and owned three different power boats. The *Ida B.* was wrecked below Wimmer's ranch on the Green River; the *Utah* was abandoned about five miles below Greenriver and allowed to rot; a third power boat was abandoned near Moab in 1927. None of these boats made but a few trips. Blake's experiments with the river extended over a period of about twenty years. His operations were confined to

pleasure parties, hunting, prospectors, etc. Blake has completely abandoned all river transportation, because he found it unprofitable and unpractical. (Abs. R., Vol. 2, pp. 1339, 5208, 5220–5222.)

In the year 1925, the Moab Garage constructed a flat-bottomed barge. (Abs. R., vol. 1, p. 308.) The boat was constructed for the purpose of performing a transportation contract which the Moab Garage Company had with the Midwest Exploration Company to transport certain oil-drilling supplies from the town of Thompson on the Denver & Rio Grande Railroad to the Company's drilling sites on the Colorado River below Moab, Utah. (Abs. R., vol. 1, p. 258.) The Garage contract provided a rate of $1.75 per 100 pounds from Thompson to Well No. 1. The distance from Thompson to the dock at Moab was approximately 34 miles by wagon road, and the contract contemplated a transportation rate from Thompson to the river bank by truck at the rate of 50 cents per 100 pounds. That allowed $1.25 per 100 pounds for the 18 miles of water transportation. The barge cost approximately $7,000. Later there was a readjustment of the rates of transportation to oil wells farther down the river.

The barge was operated almost exclusively by the witness, Virgil Baldwin. (Abs. R., vol. 1, p. 311.) The operation of the barge was attended by many difficulties on account of the constant rearrangement of sand bars (Abs. R., vol. 1, p. 308), and this was especially true when no trips had been made for several days. When this occurred it was difficult to

operate the boat without getting on the sand bars. (Abs. R., vol. 1, p. 308.) Going downstream it was possible to make approximate speed of 8 miles per hour; coming upstream approximately 3 miles per hour. (Abs. R., vol. 1, p. 308.) Sand bars were encountered on approximately 75 per cent of the trips and it was usually necessary to take lines ashore to free the boat. Twenty-five percentum of the time the boat was stuck from a few hours to a day and a half. (Abs. R., vol. 1, p. 326.)

The barge was never taken below Lockhart Canyon (40 miles below Moab), and most of its trips were to Shafer Well No. I (18 miles below Moab).

In the winter season ice gave trouble with the operation of the barge. The barge was frequently stuck on the sand bars in the afternoon, and it was necessary to stay all night on the river. (Abs. R., vol. 1, p. 326.) Most of the trips were made with the barge during the first year of its construction.

It will be seen from the above extracts from the testimony that the Moab Garage barge was constructed for a special purpose. The rates charged for transportation were excessively high, and the use of the river by the barge within the meaning of the cases heretofore cited must be termed a temporary or an exceptional use.

The operations of the Midwest Refining Company in that territory were under the direction of John B. Cleary. (Abs. R., vol. 2, pp. 749–751.) He had special charge of the transportation facilities to and from the wells. (Abs. R., vol. 2, pp. 749–752.) In

order to meet the anticipated requirements for transportation, a road was surveyed (Abs. R., vol. 2, pp. 751, 758, 760–764, Compl. Exhibits 462, 463, 464, 464a, and 464b) and also a pipe line (Compl. Exhibit 461, Abs. R., vol. 2, pp. 754–755.)

Messrs. Aurand (Abs. R., vol. 1, p. 385) and Prommel (Abs. R., vol. 1, p. 268), engineers for the Midwest Refining Company, also investigated the question of navigability of the river and rejected it (Aurand, Abs. R., vol. 1, pp. 392, 394, 400; Prommel, Abs. R., vol. 1, pp. 270–272) as a means of transportation in the event it developed into a commercial field.

In the last year, the barge of the Moab Garage Company has made only a few trips and undoubtedly in the near future, it will be dismantled because there is no further use for it.

The *Charles H. Spencer* was the major commercial attempt on the Colorado River below Mile 176. The boat cost about $30,000. Two United States inspectors examined the hulls and boilers and helped launch the boat (Abs. R. Vol. 2, pp. 782–785); the boat was to be used for pushing barges from Lees Ferry to Warm Creek and for hauling coal. The boat only made two round trips, and then returned to Lees Ferry, where it was tied up and sunk. The boat in all brought about 8 tons of coal to Lees Ferry. On one of the trips the boat got stuck on a sand bar for three days, about a mile and a half from Lees Ferry. Johnson (Abs. R. Vol. 2, pp. 786–787).

The boat dragged a chain 100 feet long, made out of five-eighths inch iron, in order to hold the boat from slipping around in the whirlpools, and from getting on sand bars, and for the same reason they had to travel downstream backwards with the boat and let the chain drag from the front. Whenever the boat stopped, the chain had to be taken in immediately, or it would get in the sand and become lost. They lost two chains in that way. Johnson (Abs. R. Vol. 2, pp. 789–790).

Between Greenriver, Utah, and Mouth of San Rafael (M. R. 86, Exceptions 24, 26, 27, 29).—The total drop of the 22.4 mile stretch between Greenriver and the mouth of the San Rafael is 59 feet, an average rate of 2.6 feet to the mile. Of the total fall 37 feet were concentrated at 14 riffles, having a total length of 4 miles with an average drop of 9.3 feet to the mile. In this stretch of the river Ross, with a boat drawing seven inches, grounded (Abs. R. Vol. 2, 1055); the *Major Powell* tied up at Halverson's Ranch because it could not ascend the riffles; the *Undine* punched a hole in the bottom of the boat (Abs. R. Vol. 2, p. 1059); *City of Moab* grounded frequently, and on return trip tied up at Wolverton's because it could not ascend riffles; as the *Cliff Dweller* it could not make Greenriver on the upstream trip (Abs. R. Vol. 1, p. 179); Kolb in a row boat struck on a rock (Abs. R. Vol. 1, pp. 214, 218); Clark did likewise (Abs. R. Vol. 1, p. 492); supplies for government party were hauled overland to Wimmer's Ranch because they had difficulty

in getting boats to Greenriver. Richardson (Abs. R., Vol. 2, pp. 929–936,) Sawyer (Abs. R., Vol. 1, p. 599), Shaw (Abs. R., Vol. 2, p. 921).

The town of Greenriver was the natural point of origin of all traffic and likewise the destination for upstream boats. The reason for tying up below the riffles was the impediments to further operation of boats. In *The Montello, Economy Light, etc.*, v. *United States* and *St. Anthony Falls* v. *Board of Power Commissioner cases, supra* (M. R. 84, Exception 29) open water existed both above and below the obstruction, which was only an incident along the highway. There was no open water above Greenriver.

Greenriver, Utah, to mouth. (M. R. pp. 58–72, Exception 14).—The operation of boats over rapids and riffles between Greenriver, Utah, and the mouth of the San Rafael is always accompanied with some danger and confined almost exclusively to downstream operation as far as boats without motors were concerned. (Blake, Abs. R. vol. 1, p. 248.) Below the mouth of the San Rafael difficulties encountered were largely in connection with sand bars. Parley Galloway (Abs. R. vol. 1, p. 298) describes operation as follows: "There are trips you don't have quite so much trouble, but the other places you have enough to make up for it." Again (Abs. R. vol. 1, p. 298): "In places we find little strips we get along all right, in other places the boat will run on the gravel and sand bars." Nye (Abs. R. vol. 2, p. 1050), in going downstream with rowboat to which was attached an Evinrude motor, states that

he was in the water most of the time between Greenriver, Utah, and the mouth of the San Rafael (Exception 27) and hardly an hour a day he was not in the river pulling the boat off bars below the mouth of the San Rafael. Ross (Abs. R. vol. 2, p. 1055) discusses rowing and towing boat upstream and (Abs. R., vol. 2, p. 1058) rowing with two sets of oars upstream and also towing the boat from Valentine Bottom to Wimmers' Ranch; made an average of 9 miles a day. Loper (Abs. R. vol. 1, p. 623), Kirkpatrick (Abs. R. vol. 1, p. 700) discuss typical operations of rowboats in this stretch. Colonel Dent made only 5 miles in 5 hours upstream with one of the small boats of the Moab Garage and could find no crossing where the water was deep enough for him to proceed. (Abs. R. vol. 1, p. 344.) It is significant that all of the trips with small boats between Moab and Greenriver were made down the Green and up the Colorado rather than vice versa. (See Appendix to brief, p. 151.) Kolb hit sand bars in Stillwater and Labyrinth Canyons (Abs. R. vol. 1, p. 214.) Hite had to take two cows off a flatboat to get it off sand bars. (Abs. R. vol. 2, p. 908.) Loper hit many bars. (Abs. R. vol. 1, p. 633.) Richardson in motor boat could not avoid the bars. (Abs. R. vol. 2, p. 935.) Sawyer was stuck in the Marguerite (Abs. R. vol. 1, p. 601.) For other instances see Appendix to brief, p. 151.

Colorado River—Castle Creek to Moab, Utah (M. R. 73 to 75, Exception 18).—In this stretch of the river, experiments with boats was confined principally to row boats. All boats had trouble at Nigger Bill

Rapids. Up stream travel was accomplished only by rowing and towing. In the history of the river, there has probably not been more than a dozen boat trips on this stretch. (M. R. 148, Exception 50.) In 1897, 1898, 1902 to 1909 rafts of lumber were taken down on the Colorado River from the mouth of Castle Creek to Moab. About ten such rafts were taken down each of the years mentioned. The timber was cut in the LaSal Mountains, about 22 miles from the river and the lumber was hauled by team to the mouth of Castle Creek. It took about a day to make each trip and when the water was low it took longer. Submerged rocks were struck at all stages of the water, but the biggest difficulty was head winds. One raft was lost and part of another was destroyed through difficulties encountered in the river. No trouble was encountered from sand bars, but the rafts would become water-logged, thereby causing them to draw more water. The mud from the water would also weigh them down, which would cause them to sink deeper and run slower. Branson (Abs. R., Vol. 2, pp. 1183–1193). The men returned overland to the sawmills. (Appendix to brief 168.)

Colorado River, Moab to head of Cataract Canyon. — (M. R. pp. 76–80, Exception 19.) In connection with upstream progress of rowboats used in trapping expeditions, Parley Galloway (Abs. R., vol. 1, p. 297) states: "While it is always bad enough with a rowboat, some of it you can row and some of it you can tow your boat the best way you can. We have sand

bars running behind a sand bar; sometimes had to turn and go back again and find some little channel that you could get your boat through." Mendenhall (Abs. R., vol. 2, p. 890) discusses the operation of one boat with two men—"worked our way up anyway we could; rowed when we could, towed when we could, and poled some." Nye (Abs. R., vol. 2, p. 1050) upstream operation of outboard motor, discussed frequent bar trouble and was just able to get boat through The Slide with motor running full speed. (Appendix to brief p. 58, 160, 113, Exception 28.) Dugan was on the bars (Abs. R. Vol. 2, p. 775), and on a subsequent trip observed channel had changed (Abs. R., vol. 2, p. 778). Thunder showers changed the water level and brought in much débris from side washes. (Abs. R., vol. 2, p. 778). Dobbin had trouble in straight stretches (Abs. R., vol. 1, p. 377). Baldwin had trouble; hit bars and sheared off pins of motor. (Abs. R., vol. 2, p. 307). For other instances see Appendix to brief, p. 170.

Glen Canyon.—Galloway (Abs. R., vol. 1, p. 284) testifies:

> There is no part of the river (Glen Canyon section) that a man if he can boat it at all, and will use proper precautions, that he will not run into the difficulties that exist there if he don't watch out what he is doing.

The downstream operation is a constant fight with sand bars, boils, swirls, shipping water, swamping in sand waves, grounding on rapids. Colonel Dent (Abs. R., vol. 1, p. 328); Loper (Abs. R., vol. 1, p. 623);

Thomas (Abs. R., vol. 1, p. 644); Caldwell (Abs. R., vol. 1, p. 652); Bennett (Abs. R., vol. 2, p. 826); Hite (Abs. R., vol. 1, p. 902). Upstream navigation was a question of 90 per cent tow and 10 per cent row. Loper (Abs. R., vol. 1, p. 623); Galloway (Abs. R., vol. 1, p. 284) never tried to go upstream with rowboats. Boats have been dragged and rowed by Loper from Lees Ferry to Hite and from Red Canyon to Hite. (Abs. R., vol. 1, p. 623.) Average upstream progress about 7 or 8 miles a day. Marrs (Abs. R., vol. 1, p. 638) discussing operation of motor boats upstream from Warm Creek, states "if you lose a minute you will drift back more than you can make in 15 minutes." Barnes (Abs. R., vol. 1, p. 655) describes taking an 18-foot motor boat, 18-inch draft, upstream from Lees Ferry to Dandy Crossing in 13 days; average upstream progress 12 miles a day; lined boat many times; wrecked three times; launch capsized once. He contemplated running passenger boats from Lees Ferry to Rainbow Natural Bridge, Utah, but found it impractical (Abs. R., vol. 1, p. 656, Exception 58). Freeman (Abs. R., vol. 1, p. 660) shows constant fighting of sand bars and currents and riffles while six men took four boats to Halls Crossing, 119 miles in two weeks. (Average upstream progress 8 miles a day.) Operation of boats and scows as ferry boats to get supplies back and forth across the river, discussed by Weber (Abs. R., vol. 1, p. 690); Bennett (Abs. R., vol. 2, p. 826); Harshberger (Abs. R., vol. 1, p. 649); Mendenhall (Abs. R., vol. 2, p. 890), described

rowing and towing the boat from the mouth of the San Juan River to Hole-in-the-Rock. Hite (Abs. R., vol. 2, p. 902) describes how it took 13 men 26 days to bring launch up to Hite; Kolb (Abs. R., vol. 1, p. 206) doubts if he would be able to take a boat upstream through Glen Canyon rapids. At the time of trial there were no boats or rafts on this section of the Colorado River, except 1 small row boat (Dent, vol. 1, p. 357; Exception 57). From the above history of boats in Glen Canyon supplemented by pages 177 to 187 of the Appendix to brief, it may be said that neither depth, velocity, rapids, sand waves, nor sand bars permit the successful operation of boats of any kind (Exceptions 62, 63; 64, 65). The evidence shows no susceptibility of navigation (Exceptions 66, 67). Operation of boats under such circumstances cannot be said to be travel in customary modes of trade and travel on water.

Overland travel preferred

Greenriver, Utah, and Moab were the only towns connected by the rivers. Before the general use of automobile trucks, these towns were four days overland apart. The trip on the river took even longer. To-day the trip is made regularly in about two hours. The difficulties of overland travel in the old days could produce no successful use of the rivers between these two towns, and no merchant ever used the rivers for transportation (M. R. 56, Exception 10). It is certain that in future the automobile trucks will not be displaced by use of the river

(Abs. R., Newby, vol. 2, p. 837, Ross, vol. 2, p. 1055.)

Merchandise to and from Moab (Abs. R., vol. 1, p. 258), Bluff (Abs. R., vol. 1, p. 258) and Monticello went overland; Hite was supplied via Hanksville overland (Abs. R., vol. 2, p. 902). The mail for Hite came in overland. (Abs. R., vol. 2, p. 904.) Stanton blasted a road in to the Colorado River to bring in mining machinery from Greenriver, Utah, which was the nearest railroad town. The overland trip was 110 miles through a rough, barren, and desolate country. (M. R. 127, Exception 56.) (Abs. R., vol. 1, p. 611.). Harshberger investigated the Colorado River to ascertain if he could bring down mining machinery from Greenriver. He brought it down overland. (Abs. R., vol. 1, p. 649.)

Stanton sent boats overland (second expedition) from Greenriver to Crescent Creek (Abs. R., vol. 1, p. 556), Moab Garage Co. from Moab to mouth of San Rafael (Abs. R., vol. 1, p. 36), Galloway from Greenriver to North Wash (Abs. R., vol. 1, pp. 287), Governor Dern, en route from Moab to Glen Canyon, preferred overland trip (Abs. R., vol. 2, p. 1400).

Wimmer took boats overland either from Greenriver or Richfield to Glen Canyon and hauled supplies overland from Greenriver to Glen Canyon. (Abs. R., vol. 2, p. 1226.)

Good Hope Company built a wagon road in canyon between Good Hope and Tickaboo Bars. (Abs. R., vol. 2, p. 845.)

Overland travel was over difficult roads. The country was barren and long stretches were without water. It was necessary to transport both feed and water for the wagon and pack animals. The difficulties of overland travel accentuated the desirability for river travel if possible. The fact that the river was not used for transportation is persuasive evidence that the river possessed no navigable possibilities. (Exception 55.)

This is an entirely different situation from that appearing in *United States* v. *Holt State Bank*, 270 U. S. 49, 57, where it is said:

> The country about had been part of a bed of glacial lake Agassiz and was still swampy, so that the waterways were the only dependable route for trade and travel.

What Is Commerce When Navigability Is the Issue

(M. R. 105, Exceptions 43, 44, 48)

The Complainant has excepted to the Master's conclusions with reference to commerce. The words "commerce" and "useful commerce," as used in the cases, where the navigability of a river or a lake is the issue, must be interpreted as meaning the exchange and transportation of goods and a use of travel by the general public for commercial purposes. Personal use without the commercial element does not satisfy the test of navigability. That test can only be met by showing navigation of sufficient proportions that the river may be truly said to be a highway of commerce.

The word "commerce," when used as a test of navigability, is entirely apart from the word "commerce" in the Constitution of the United States. Cases arising under the commerce clause of the Constitution and statutes passed pursuant thereto are not helpful in understanding the word "commerce" when used as a test of navigability of streams and lakes. Undoubtedly the shipment of goods from New Orleans and Shreveport, Louisiana, to points on the Red River in Oklahoma and Texas was interstate commerce. (See *Oklahoma* v. *Texas*, Appendix to Brief, page 187, et seq.); but considering the extent and difficulties under which it was accomplished it was not "useful commerce," when navigability was the issue nor commerce sufficiently substantial to characterize the Red River along the Oklahoma boundary as a navigable stream. Even though interstate commerce, it fell short of impressing the Red River with a public servitude as a highway of commerce.

The Master has cited (See report pages 106, 107) the cases of the *Gloucester Ferry Company* v. *Penna.* 114 U. S. 196, 204; *United States* v. *Hill*, 248 U. S. 420, 423; *Thornton* v. *United States*, 271 U. S. 414, 424; *Federal Trade Commission* v. *Pacific States Paper Trade Association* 273 U. S. 52.

The first of these cases had to do with the operation of a ferry on the Delaware River between Philadelphia and points in New Jersey.

In the second case the question was whether or not a person carrying a quart of whiskey from one State

to another, on a trolley car, was subject to prosecution under Paragraph 5, Act of March 3, 1917, Chap. 162, 39 Stat. 1058, 1069.

The third case involved the driving of diseased cattle from one State to another, and this was held to be interstate commerce.

The Master (M. R. p. 106) cites these cases as illustrative of his conclusion, "Therefore, whatever is 'commerce between the States,' under the Constitution, must constitute the 'commerce' for which waters must be used or be capable of being used, in order to make them navigable waters of the United States." This conclusion is not justified by the decided cases.

The record in *Oklahoma* v. *Texas* shows that throughout the course of the Red River many ferries were operated.

If, in the case of *United States* v. *Hill*, *supra*, the whiskey had been transported by one of the ferries on the Red River, from Texas to Oklahoma; or, had the diseased cattle, as in the case of *Thornton* v. *United States*, *supra*, been transported from Texas to Oklahoma on a ferry, the transportation would have been interstate commerce, but the commerce would not have been commerce of the character necessary to establish the Red River as a navigable stream.

On the rivers in question the uses have been more of a private nature than of a public commercial one.

The use of the river by the miners was for the special private purpose of reaching and working the bars and crevices along the river. In many instances the boats and rafts taken down the river by the

miners were taken for the purpose of converting the lumber in the boats and rafts into sluice boxes. The operations possessed none of the elements embraced in the words "useful commerce," nor can such a use be termed a public use for transportation in customary modes.

Every case decided by the Appellate Courts of the United States wherein the question of navigation was involved sustains the view that, in order to constitute a river a navigable one, it must appear that such river is commercially used or susceptible of commercial use by the public for the purposes of transportation. This of necessity excludes from the category of navigable rivers those upon which travel and transportation are limited to private purposes.

In *The Montello Case*, 20 Wall. 430, this Court states that the Fox River had from the earliest times been used as a highway of commerce between the East and the Northwest, and that an immense fur trade was carried over it for more than a century.

Likewise, in *The Daniel Ball*, 10 Wall. 557, public commercial use of the river was clearly shown.

In *Economy Light & Power Company* v. *United States*, 256 U. S. 113, the element of public commercial navigation was also present. Like the Fox River, the Desplaines River was a great highway of commerce between the East and the West.

In *United States* v. *Holt State Bank*, 270 U. S. 49, the element of public commercial navigation was present. It appeared in that case that Mud Lake was a part of a highway which extended to the Red

River of the North, and then north to the international boundary line, and that merchants in towns several miles up on Mud River used the river for sending for and bringing in their merchandise.

Cases decided by this Court, holding rivers to be navigable, may be summarized with the statement that in no case has a river been held navigable where commercial navigation by the public upon a substantial scale was not shown.

On the other hand, no decision suggests or intimates that proof of navigability of a river may rest upon evidence that the river was used for floatage for noncommercial purposes, or for pleasure boats or by a limited use of small boats commercially or semicommercially. In every one of the cases where the courts have held the streams or lakes to be nonnavigable there has been proof of noncommercial navigation and in many of them proof of a limited commercial navigation.

In the case of *Gratz* v. *McKee*, 270 Fed. 715, 716 (C. C. A., 8th Circuit) it appeared—

(*a*) That the river in question was used for rafting and floating logs.

(*b*) That small craft, small boats, and dugouts carried provisions.

(*c*) That the river was used by farmers to take milk and corn in small boats across the river.

The court said:

> * * * Upon a full consideration of the record, we are of the opinion that the river is nonnavigable in any sense that would consti-

tute it a part of the public waters of the state: *Harrison* v. *Fite*, 78 C. C. A. 447, 148 Fed. 781.

A stream is navigable in fact only where it affords a channel for useful commerce and of practical utility to the public as such. The fact that there is water enough in places for rowboats, or small launches, answering practically the same purpose, or that hunters and fishermen pass over the water with boats ordinarily used for that purpose, does not render the waters navigable. *Schulte* v. *Warren*, 218 Ill. loc. cit. 119, 13 L. R. A. (N. S.) 745, 75 N. E. 785.

It is held that navigable waters must be capable of practical general uses. *Hubbard* v. *Bell*, 54 Ill. 110, 5 Am. Rep. 98.

If its location is such and its length and capacity so limited that it will only accommodate a few persons it can not be considered a navigable stream for any purpose. It must be so situated, and have such length and capacity, as will enable it to accommodate the public generally as a means of transportation * * *.

* * * * *

But even though this so-called river be regarded as navigable, in this very restricted sense, for small uses in the floatage of logs, and for skiffs and dugouts during high water, when the roads are bad, as is usual in most swamp and overflowed districts, nevertheless, such local, limited, and intermittent forms of use can not transform waters otherwise non-navigable into navigable streams, or catalogue them among public waters of the state; and

> the use which any person may lawfully make of such waters is limited to such incidental right of floatage or qualified navigation. (p. p. 716–717.)

On certiorari to this Court, the judgment of the Court of Appeals was affirmed. (See *McKee* v. *Gratz*, 260 U. S. 127.) Court disposed of the question of navigation by saying (p. 136):

> * * * We say nothing about the character of the stream as to navigability. The jury at least might find that there was nothing in that to prevent the application of what we have said. We are slow to believe that there were public rights extending to the removal of mussels against the landowner's will.

It will be noted in the above opinion of the Court of Appeals that there was a limited use by the public of the river for the floatage of small boats and some commercial navigation. But this Court held that such limited operation of boats was not sufficient evidence to constitute the stream navigable in law and in fact.

In the case of *Toledo Liberal Shooting Company* v. *Erie Shooting Club*, 90 Fed. 680, the commercial aspect was given serious consideration. It was possible to operate canoes and flat-bottomed ducking boats in the pursuit of ducks and other water fowl.

The court makes the following significant statement (p. 682):

> None of the characteristics of commercial navigability are shown here.

With reference to the use of canoes and flat-bottomed boats for hunting purposes, the court observes (p. 682):

> That it is not commerce and proves nothing. The same test would convert every pond and swamp capable of floating a boat into a navigable stream or lake.

On the same page the court finds that navigability is contingent upon capability of use as a highway for purposes useful to trade or agriculture and concludes by saying:

> It is the capability of being navigated for useful purposes which is the test.

The court held that the waters in that case were nonnavigable. The conclusion reached by the court clearly demonstrates that proof of commercial navigability, or navigability for useful purposes or capability for use as a highway of commerce is not met by showing that hunters and others could operate small boats.

Likewise in *Harrison* v. *Fite*, 148 Fed. 781, there was proof of the use of the stream in question by duck hunters who shot for sport and for the market. At page 783, the court says:

> To meet the test of navigability as understood in the American Law, a water course should be susceptible of use for purposes of commerce or possess a capacity for valuable floatage in the transportation to market of the products of the country through which it runs.

As has been pointed out, there was ample evidence in that case that the river in question was used by

duck hunters and fishermen. In principle there is no difference between a fisherman's or a duck hunter's outfit, when he is engaged in that occupation for profit, and a miner's outfit. The finding of the court was that the stream in question was nonnavigable and this finding, of course, justifies the conclusion, that in the opinion of that court, proof of substantial commercial navigation was essential to establish the stream as a navigable one.

In *Oklahoma* v. *Texas*, 258 U. S. 574, the character of the navigation upon the Red River, as set forth in the Court's opinion, is supplemented by statements in the Appendix to this brief. In the Appendix only the more important attempts at navigation are included. The record in the case discloses that numerous small boats of all descriptions were used on this river for many years. The use of small boats is not discussed in the opinion of this Court and in all probability for the reason that if the use of the larger boats was not sufficient to constitute the stream a navigable one, the small boats would contribute nothing additional to the solution of the question of navigability.

The first paragraph, page 591, of the opinion clearly indicates that the trade and travel upon a river sufficient to characterize the river a navigable stream must be commercial. This Court concludes the paragraph with the statement:

> * * * A greater capacity for practical and beneficial use in commerce is essential to establish navigability.

In *Brewer-Elliott Oil Co.* v. *United States*, 260 U. S. 77, the evidence and the findings of fact of the trial judge (see record of case in this Court) shows the actual use of the Arkansas River far exceeded anything upon the Green and Colorado Rivers in Utah. The evidence also shows that there were many pleasure boats on the river at the cities of Muskogee, Tulsa, Arkansas City, and other places. (See Appendix to brief, pp. 196, 198.) This Court adopted the findings of the trial judge and held that the river at the points in question was nonnavigable, and states, as a prerequisite to navigability, it must be shown that the river "affords a channel for useful commerce." There was ample evidence as to the use of boats for private purposes, and the conclusion of nonnavigability by this Court, therefore, interprets the words "useful commerce" as meaning substantial, practical, commercial use of the rivers by the public.

This discussion justifies two conclusions:

1. This Court has never held a river or lake navigable unless there was positive proof of practical, substantial, and commercial navigation.

2. In no case has this Court held that the operation of noncommercial, semicommercial, or small boats establishes the navigability of a stream or lake or its susceptibility for use as a highway for commerce.

Measured by the rules announced in the cases cited, *supra*, the boating in Utah on the Colorado and Green Rivers falls short of establishing navigability.

Profitable and future commerce

(M. R. 110, Exception 46)

The evidence amply establishes that the commercial experiments upon the river have resulted in failure and abandonment. Commerce in boats can hardly be said to be "practical," "useful," or of "any service," unless attended with some degree of profit. A river can not become a "highway of commerce," unless those who operate boats can accomplish these trips with sufficient profit to themselves to warrant continuance, and this is especially true when the rivers possess characteristics which will in the future interfere with river traffic as much as it has in the past.

The Master speculates on future commerce. (M. R. 112, Exception 47.) This Court did not do that in *Oklahoma* v. *Texas;* or in *Brewer-Elliott Oil Co.* v. *United States, supra.*

In *Harrison* v. *Fite*, 148 Fed. 781, it was said "a theoretical or potential navigability, or one that is temporary, precarious, and unprofitable is not sufficient."

In *Gulf & I Railway Company* v. *Davis*, 26 F. (2nd) 930, 933; the court said:

> Plaintiffs say that the rule has never been better stated than in *Harrison* v. *Fite* (C. C. A.) 148 F. 783, quoted with approval in *North American Dredging Co.* v. *Mintzer* (C. C. A.) 245 F. 297, 309. That plaintiffs are right in insisting, where a stream has never been impressed with the character of navigability

> by past use in commerce, that commerce actually in esse or at least in all reasonable possibility in posse is essential to navigability, I think can not be doubted.

In view of the lack of commerce upon the river in the past, the Master's conclusion as to the future is too speculative upon which to base susceptibility of navigation for the future.

THE FACTS COMPARED WITH THE FACTS IN OTHER CASES

Sections of three great western rivers have been before this Court on the issue of navigability.

In *Oklahoma* v. *Texas*, 258 U. S. 574, the part of the Red River forming the boundary line between Texas and Oklahoma held to be nonnavigable above the Oklahoma-Arkansas boundary line.

In *Brewer-Elliott Oil and Gas Company* v. *United States*, 260 U. S. 77, the Arkansas River was held nonnavigable above the mouth of the Grand River.

In the case of the *United States* v. *Rio Grande Dam and Irrigation Company*, 174 U. S. 690, the Rio Grande River in New Mexico was considered and held to be nonnavigable in that State.

Oklahoma v. *Texas* was a case within the original jurisdiction of this Court, and the testimony was taken by a Commissioner, who made no findings of fact.

With reference to the Western section of the river, this Court states (p. 587) that only at short intervals when the rainfall was running off could even very

small boats be operated thereon. With reference to the Eastern section of the river this Court concludes (p. 589) that "boats with a sufficient draft to be of any service can ascend and descend only during the periods of high water." Neither the words "small boats" nor "boats with a sufficient draft to be of any service" can be definitely understood without a reference to the record in the case.

The terms used in the opinion are general terms, and, to convert general terms into specific terms, reference must be made to the record and to no other place. (See Appendix to brief, pages 187–196.)

In *Oklahoma* v. *Texas*, 258 U. S. at 589, this Court says:

> Of course, the conditions along that part of the river greatly affect the part in the eastern half of the State. But the latter receives additional waters from the Washita and other tributaries and has a practically continuous flow of varying volume, the extreme variation between high and low water being about thirty feet. When the water rises it does so very rapidly and it falls in the same way. The river bed has a fall of more than one foot to the mile and consists of light sand which is easily washed about and is carried down stream in great quantities at every rise of the water. At all times there is an almost continuous succession of shifting and extensive sand bars. Ordinarily the depth of the water over the sand bars is from six to eighteen inches and elsewhere from three to six feet. There is no permanent or stable channel. Such as there

is, shifts irregularly from one side of the bed to the other, and not infrequently separates into two or three parts. Boats with a sufficient draft to be of any service can ascend and descend only during periods of high water. These periods are intermittent, of irregular and short duration, and confined to a few months of the year.

Lanesport, Arkansas, which is near the Oklahoma boundary, has been the usual head of navigation; but for several years before railroads were extended into that section boats of light draft carried merchandise up the river to the mouth of the Kiamitia and other points in that vicinity and took out cotton and other products on the return trip. This occurred only in periods of high water and was accomplished under difficulties. In very exceptional instances boats went to the mouth of the Washita, where some had to await the high waters of the next season before they could return. When the railroads were constructed this high water of flood navigation ceased. That was between 1875 and 1880.

In Brewer-Elliott Oil and Gas Company v. *United States* 260 U. S. 77, 86, involving the Arkansas River this Court accepted the facts found by the Circuit Court of Appeals and by the District Court. (See 270 Fed. 100, 103; 249 Fed. 609, 623.) It will be observed that in the report of the District Court's opinion (249 Fed. 623) the summary of the testimony of certain witnesses was omitted from the printed report for the purpose of reducing the length of the

opinion. The opinion, however, is printed in full in the abstract of the record of the case on file in this Court (see record p. 769 et seq.) and discloses (p. 788) boats called *Cleveland* or *Kansas Millers*, and *The Carrie Clyde* operated to a limited extent above the Grand River; that the *City of Muskogee* was operated for excursion purposes near the town of Muskogee; that a boat carrying 90 to 100 tons could operate between Weber Falls and Grandriver; that ferries were maintained at numerous places on the river; that near the City of Tulsa there were skiffs, gasoline launches, and house boats. For other instances of operations of boats, see Appendix to this brief, page 196.

This description presents a picture of a river more adaptable for the purpose of navigation than either the Colorado in Utah, the Green, or the San Juan rivers.

The Red River is below the latitude where the temperatures are low enough to produce ice in the river during the winter months.

The Colorado and Green Rivers are subject to ice practically three months of the year.

The water of the Red river rises rapidly and falls in the same way.

On the Utah rivers the rise is more rapid and more violent.

The Red River has a fall of more than one foot to the mile.

The Colorado (Grand) River has a fall, between Castle Creek and Moab, of 4.4 feet to the mile; from Moab to the Junction, on the Green river, of 1.14 feet

to the mile; the Green River, between the town of Greenriver and the mouth of the San Rafael has a fall of 2.6 feet per mile; between the mouth of the San Rafael and the Junction, a fall of about 1.15 feet per mile. The Colorado River, between Mile 176 and the Arizona-Utah line, a fall of about 2 feet to the mile.

Like the Red River, the Utah rivers are filled with a succession of contantly shifting sand bars. In the Utah rivers these sand bars may change from day to day. Like the Red River, the Utah Rivers have no permanent or stable channels, and within the confines of the canyon walls the current shifts from time to time, and braided channels are quite frequently found.

The commerce on the Red River exceeded anything which has ever been attempted or hoped for on the Utah rivers. (See Appendix to brief, page 187.)

The history of the Red River shows that over a period of many years fishing and hunting boats, ferries, lumber rafts, launches, logs, and steamboats at times were operated on the Red River; that prior to the coming of the railroads, boats laden with merchandise from New Orleans and Shreveport, Louisiana, went upstream to Kiamichi, and even as far as the mouth of the Washita, and returned with the products of the soil.

No such situation arises upon the Green River. Every commercial experiment on this river resulted in failure and the abandonment of the boats.

At page 120 (last line) of his report the Master quoting from *Oklahoma* v. *Texas*, *supra*, states as follows: "Thus it is said that on the Red River 'boats can ascend and descend only during periods of high water.'" It will be noted that the text of the opinion reads (p. 589):

> Boats with *a sufficient draft to be of any service* can ascend and descend only during periods of high water. (Italics ours.)

Undoubtedly when the italicized words are added to the Master's statement, an entirely different conclusion must follow. This Court, by limiting its remarks to boats "with a sufficient draft to be of any service" does not state that rowboats, ferries, light motor boats can not ascend and descend at all seasons of the year. The evidence in the case indicates that light boats are always on the eastern section of the Red River.

The Master assumed (M. R. 121) that when this Court in *Oklahoma* v. *Texas* denied the navigability of the Red River in the sections in question in that case and said (p. 591)—

> Its characteristics are such that its use for transportation has been and must be exceptional, and confined to the irregular and short periods of temporary high water—

that the Court meant boats irrespective of size or use. It is evident from the text of the whole paragraph, the use meant is transportation of sufficient magnitude, so that the river could be truthfully said to be a highway of commerce.

The small boats operated at irregular times upon the rivers in Utah are not the kind described in *Oklahoma* v. *Texas*, *supra*, as sufficient to be of such service to constitute proof that these rivers have a practical use in commerce.

At page 121 of the Master's Report, he quotes from *United States* v. *Brewer-Elliott Oil & Gas Co.*, 249 Fed. 609, 623, as follows:

> * * * The use of that portion of the river for transportation boats has been exceptional and necessarily on high water, was found impractical, and was abandoned. The rafting of logs or freight has been attended with difficulties precluding utility. There was no practical susceptibility to use as a highway of trade or travel,

with the comment that the quotation is not descriptive of the conditions on the Green and the Colorado Rivers.

True, the operation of boats on the Green and Colorado in Utah was not at times of high water. High water on these rivers was a hazard to be avoided. A medium stage of water was most desired, but this situation also limited the months when boats could be operated. Navigation at all stages in Utah was found impractical and abandoned. When this Court says of the Arkansas River that it lacked "practical susceptibility to use as a highway of commerce," it aptly describes the Green and Colorado Rivers.

The other cases referred to on page 122 of the Master's Report, have already been commented upon in this brief, see page 45.

On the Colorado River, between Castle Creek and Moab, navigability, if it is navigable, must rest upon the experience in bringing down the few lumber rafts at irregular times, and the few small boats. Between Moab and the Junction it must rest upon the experience of the scow of the Moab Garage Company, which made most of its trips only 18 miles down the river, and none exceeding 40 miles. On the Green River navigability must rest upon the experience of a few rowboats and light motor boats. The navigability of the Colorado River between Mile 176 and the Utah-Arizona line must rest upon the experience of a few miners going short distances downstream with rafts and rowboats and coming like distances upstream in rowboats by towing and poling, and in the operation of a few motor boats equipped with outboard motors. No raft ever went upstream in this section of the river, but one owned by Stanton, and that was taken up the river from time to time by a steel cable attached to a windlass.

These instances of boating are not such navigation as establishes the rivers as highways of commerce, neither is it travel in customary modes.

VII

INDIAN RESERVATIONS ADJACENT TO THE RIVERS

Significance of the Acts of Congress and Executive Orders affecting the Navajo and other Indian reservations in Utah

(Exception 2)

The Executive Order of May 17, 1884 (Compl. Exh. 71), creating a reservation for Indian purposes in Utah, described the reservation as running up and

along the middle channel of the Colorado and San Juan rivers. The pertinent portion of the order reads as follows:

> It is hereby ordered that the following-described lands in the Territories of Arizona and Utah be, and the same are, withheld from sale and settlement and set apart as a reservation for Indian purposes, viz:
>
> Beginning on the one hundred and tenth degree of west longitude at 36 degrees and 30 minutes north latitude (the same being the northeast corner of the Moqui Indian Reservation); thence due west to the one hundred and eleventh degree thirty minutes west longitude; *thence due north to the middle of the channel of the Colorado River; thence up and along the middle of the channel of said river to its intersection with the San Juan River;* thence up and along the *middle channel* of the San Juan River to the west boundary of Colorado (32 degrees west longitude, Washington meridian); thence due south to the thirty-seventh parallel north latitude; thence west along said parallel to the one hundred and tenth degree of west longitude; thence due south to the place of beginning: *Provided*, That any tract or tracts within the region of country described as aforesaid which are settled upon or occupied, or to which valid rights have attached under existing laws of the United States prior to date of this order, are hereby excluded from this reservation.

N. B.—This includes the Colorado River from the Utah-Arizona boundary line to the mouth of the San Juan River.

At the time this order was promulgated the President and other officers of the Government had the benefit of the reports of Powell (Compl. Exhibit 51), Ives (Compl. Exhibit 72); Wheeler (Compl. Exhibit 73), and of many other military and scientific expeditions (See Appendix to Wheeler Report). If with the information at hand, the Government chose to include part of the river beds in the reservation it was because those rivers were known to be, at the places described, nonnavigable streams. This inference is clearly justified by the language of this Court in the case of *Brewer-Elliott Oil Co.* v. *United States*, 260 U. S. 77, 86:

> It is a natural inference that Congress in its grant to the Osage Indians in 1872 made it extend to the main channel of the river, only because it knew it was not navigable. This would be consistent with its general policy. Rev. Stats., Sec. 2476; *Oklahoma* v. *Texas*, 258 U. S. 574; *Scott* v. *Lattig*, 227 U. S. 229, 242; *Railroad Company* v. *Schurmeir*, 7 Wall. 272, 289. If the Arkansas River is not navigable, then the title of the Osages as granted certainly included the bed of the river as far as the main channel, because the words of the grant expressly carry the title to that line.

The significance of the Executive Order of President Arthur in including in the reservation a portion of the beds of the San Juan and Colorado rivers is pointed out by this Court in *United States* v. *Holt State Bank*, 270 U. S. 49, 55:

But, as was pointed out in *Shively* v. *Bowlby*, 152 U. S. 1, 49, 57–58, the United States early adopted and constantly has adhered to the policy of regarding lands under navigable waters in acquired territory, while under its sole dominion, as held for the ultimate benefit of future States, and so has refrained from making any disposal thereof, save in exceptional instances when impelled to particular disposals by some international duty or public exigency. It follows from this that disposals by the United States during the territorial period are not lightly to be inferred, and should not be regarded as intended unless the intention was definitely declared or otherwise made very plain.

VIII

UTAH SINCE STATEHOOD HAS TREATED THE RIVERS AS BEING NONNAVIGABLE

(Exception 1)

The scientific investigation by the United States over a period of 60 years into the possible uses of the rivers in Utah precludes any conclusion that the rivers are navigable. Utah has from the date of statehood until 1925 permitted the Government to make expenditures for these investigations without comment or claim, intimating that the State asserted ownership to the river beds based upon navigability.

Since 1896 scores of placer miners have operated in the beds of these rivers claiming rights under location notices posted and filed under the laws of

the United States. (See Compl. Exhibit 3, pp. 559 to 604, Stipulation, R. Vol. 25, p. 4282.) Utah has never protested against this method of procedure, nor sought to compel the placer miners to acquire their rights under the laws of Utah.

Power-site reservations were made by Executive Order under authority of the Act of June 25, 1910, c. (36 Stat. 847), U. S. Code, Title 43, Sec. 141, as amended by the Act of August 24, 1912, c. 369 (37 Stat. 497); U. S. Code, Title 43, Sec. 142 (Compl. Exhibits 508 to 557), and under Section 24 of the Federal Water Power Act of June 10, 1920, c. 285 (41 Stat. 1063), U. S. Code, Title 16, Section 818, by reason of the filing of applications affecting such lands.

The withdrawals for reservoir sites to be used in connection with irrigation were made under the authority of the Act of June 17, 1902, c. 1093 (32 Stat. 388), known as the Reclamation Act.

As these withdrawals were obviously intended to and did include the river beds (M. R. 114) as well as the uplands, it is evident that such use is inconsistent with navigation. Utah voiced no protest. Neither did Utah object to the United States granting oil permits.

See *Mintzer* v. *North American Dredging Co.*, 242 Fed. 553, 560, 561:

> * * * As we have seen, it has never been in fact navigated in any true sense, and has not been treated or considered, either by the public or by the state, as capable of navigation. While this lack of recognition by the state is not

conclusive, it is nevertheless not without potency as a fact in its bearing on the question since it is not to be lightly presumed that the state will part with its title to property of known or recognized value for public use.

In the year 1925 the oil prospects in the Colorado River bed below Moab became interesting. One company had expended large sums of money in the development of permits, granted under the laws of the United States, Act of February 25, 1920, c. 85 (41 Stat. 437), which included parts of the bed of the Colorado River (Compl. Exhibits 465, 466). The State of Utah immediately asserted the navigability of the rivers, and granted to other persons leases to the same portions of the river bed (See Compl. Exhibits 608 to 617, 634 to 637) as those upon which Government permits had already been issued.

Each of the State leases contained the following clause (Art. VIII–A):

> It is understood that the title to said lands of the State of Utah may be disputed by the United States or those claiming under it. Pending active litigation involving the title to said lands of the State of Utah or its right directly or through a lessee to develop and operate said lands for oil and/or gas and to produce said products from said lands, instituted either by the United States or those claiming under it, or by the State of Utah or Texas Production Company as its lessee, the requirement of actual drilling on said lands shall be suspended, and also all other operations or activities on said lands; pro-

vided, however, that in spite of such litigation, Texas Production Company shall nevertheless pay to the State of Utah the rentals hereinabove provided.

It is further understood and agreed that in the event of any such litigation so involving the title of the State of Utah to said lands or its right directly or through Texas Production Company as its lessee to develop and operate said lands for oil and/or gas and to produce said products therefrom Texas Production Company will at its own cost and expense and without cost or expense to the State of Utah defend or prosecute such litigation as the case may be.

It is evident from this clause that the State of Utah declined to assume any responsibility in maintaining the validity of the leases, and, hence, also the navigability of the streams. That litigation was cast upon those who accepted the State leases.

In order to sustain its position, Utah in 1927 enacted the following law (Laws of Utah, ~~1927,~~ page 8):

SECTION 1. *Colorado River in Utah and Green River in Utah declared to be navigable streams.*—That the State of Utah does hereby declare that the Colorado River in Utah and the Green River in Utah from time immemorial and at the time of the admission of Utah into the Union as one of the States of the United States of America were and ever since have been and are now navigable streams.

SEC. 2. *Title to the bed of all navigable rivers vested in State of Utah, when—exceptions.*—That the title to the beds of said rivers and

> of each of them, as well as the title to the beds of all other streams and lakes which at the time of said admission of Utah into the Union were navigable in fact, vested in the State of Utah at the time of its said admission into the Union and said title has at all times thereafter been and now is vested in the State of Utah, except such portion or portions thereof as may have been heretofore disposed of by the State of Utah pursuant to law, by express grant.

This law can not deprive the United States of any of its rights in the river beds, because, as has been previously shown in this brief, the rights of the parties to this suit were fixed as of the date of statehood. (Page 7.)

In the light of the evidence, Utah's conduct which has been inconsistent with navigation is entitled to consideration on the issue of navigability.

IX

CONCLUSION

NONNAVIGABILITY OF THE RIVERS HAVING BEEN ESTABLISHED, THE TITLE TO THE RIVER BEDS REMAINS IN THE UNITED STATES AND THE UNITED STATES IS ENTITLED TO THE RELIEF SOUGHT

The United States, as the riparian owner of the uplands adjacent to the sections of the rivers in question, owns the river beds because the rivers are nonnavigable in Utah and the title to the river beds did not pass to Utah upon its admission into the Union. This principle is established in the case of

Oklahoma v. *Texas*, 258 U. S. 574, 591, where, after arriving at the conclusion of nonnavigability of the Red River, this Court said:

> We conclude that no part of the river within Oklahoma is navigable and therefore that the title to the bed did not pass to the State on its admission into the Union.

Prior to the statehood of Utah, the United States owned all of the present State of Utah, including the beds of all streams, except such lands as the United States had disposed of. If the title to the beds of the Green, Colorado, and San Juan rivers did not pass to the State of Utah upon its admission into the Union, the ownership of the river beds remains in the United States.

See also *Brewer-Elliott Oil Co.* v. *United States*, 260 U. S. 77, and *United States* v. *Holt State Bank*, 270 U. S. 49.

It follows that the United States is entitled to the relief sought.

The Exceptions filed on behalf of the United States of America should be sustained. Those filed by the State of Utah overruled. A decree should be entered in accordance with the prayer of the bill of complaint, adjudging and decreeing that the United States of America holds the full and exclusive fee simple title in and is entitled to the exclusive use, enjoyment, and possession of said river beds, and every part thereof, as set forth in paragraph II of the Bill of Complaint, except the lands mentioned in Exhibit A, attached to the bill, and that the State of Utah be forever

enjoined from asserting any estate, right, title, and interest in and to said river beds, and all minerals thereunder, adverse to the Plaintiff, the United States of America, and from in any manner disturbing or interfering with the possession, use, and enjoyment thereof by the United States of America.

Respectfully submitted.

THOMAS D. THACHER,
Solicitor General.

CHARLES M. BLACKMAR,
Special Assistant to the Attorney General.

RANDOLPH S. COLLINS,
SAMUEL H. MOYER,
Attorneys.

APPENDIX

PHYSICAL CHARACTERISTICS OF THE RIVERS

Locations at which the rivers are accessible

The region does not permit free travel by automobile, horseback, or on foot. (Baker, Compl. Exh. 55, p. 4.) Testimony as noted hereafter, however, of many old-timers, explorers, prospectors, engineers, geologists, and others shows that there are certain fairly well-defined routes over which considerable travel has occurred and that in connection with exploration work there were few localities that could not be reached either on horseback or on foot. (M. R. p. 115.)

The Master concludes that the inaccessibility of the Green and Colorado Rivers from the high plateau (M. R. pp. 117, 152) is in favor of navigability. The Master's conclusions can not be correct, for, if true, all of the small western rivers upon which it was possible to float a boat would become navigable streams. The Master's reasoning would apply with equal force to Cataract Canyon and the San Juan River, both of which the Master has found to be nonnavigable. As to the future developments which the Master (M. R. p. 117) concludes might call in play river transportation, suffice it to say that the Midwest Oil Company promptly surveyed a road to their holdings, against the day when an oil field would be developed, and Stanton, in order to move his ice, electric-light plant,

and mining equipment to the Colorado River bars, actually built a road in preference to using the river.

CHARACTERISTICS OF THE RIVERS

Tortuous course

Complainant's Exhibit 10, sheets 1 to 74.—Official river survey maps clearly show the tortuousness of the rivers under consideration. Measurements show the following characteristics:

Green River:	
Green River, Utah, to mouth of San Rafael—	
Distance by river	22.3 miles.
Air-line distance	14.5 do.
Ratio, river mileage to straight line	1.54
Mouth of San Rafael to mouth of river—	
Distance by river	95.0 miles.
Air-line distance	42.8 do.
Ratio, river mileage to straight line	2.22
Colorado River:	
Castle Creek to mouth of Green River—	
Distance by river	79.2 miles.
Air-line distance	42.4 do.
Ratio, river mileage to straight line	1.87
Colorado River, mouth of Green to North Wash—	
Distance by river	49.0 miles.
Air-line distance	35.4 do.
Ratio, river mileage to straight line	1.38
Colorado River, mouth of North Wash to Utah-Arizona line—	
Distance by river	139.7 miles.
Air-line distance	82.0 do.
Ratio between river mileage and straight line	1.70
Colorado River, Utah-Arizona line to Lees Ferry—	
Distance by river	27.8 miles.
Air-line distance	14.0 do.
Ratio between river mileage and straight line	1.99

The effect of the course of the rivers upon practical navigation will be discussed in connection with sand and sediment.

Logs and débris.—LaRue, in Water Supply Paper 556 (Compl. Exhibit 62, page 15) states—

> During flood periods Colorado River carries a large amount of driftwood. In the flood of September, 1923, hundreds of logs 20 to 30 feet long and 2 to 3 feet in diameter passed through Grand Canyon.

Photograph No. 123, Compl. Exhibit 77, shows the large amount of drift being carried by the Green River on October 12, 1928, during a small flood of 12,000 second-feet (Compl. Exhibit 75, page 6).

Eddy, (Abs. R. Vol. 1, p. 6), testified to huge accumulations of drift in Cataract Canyon as high as 50 feet above the water.

Specific instances of the presence or accumulation of logs and débris are contained in the record.[1]

Logs and débris lodge in shallow places along the rivers and frequently built up obstructions which cause the channel to change and the sand bars to be rearranged.

The Master has found that logs, etc., are little impediment to navigation. (M. R. 80, Exception 21.) Evidence of actual trouble by boats with floating logs is not extensive because the floating logs come with flood water, when few ventured upon the river. Floating logs must be considered as an impediment to navigation if limited only to a hazard to paddle wheel boats because it adds one more ele-

[1] Eddy (Abs. R. vol. 1, p. 6); Blake (Abs. R. vol. 2, p. 256); Sawyer (Abs. R. vol. 1, pp. 600–601); Loper (Abs. R. vol. 1, p. 631); Johnson (Abs. R. vol. 2, pp. 805–806).

ment to the list of river characteristics against navigability.

Ice.—As is usual in localities where temperatures are below freezing for considerable periods in the winter, ice forms on the river. As shown by the Geological Survey records of daily discharge (Compl. Exhibit 94) for Green River at Green River, Utah, ice is present on the river in sufficient quantities to affect the relation between stage and discharge usually from the latter part of December to the middle of February; Colorado River near Cisco (Compl. Exhibit 89), for slightly longer periods, generally from the middle of December to the latter part of February; Colorado River at Lees Ferry, for much shorter periods, ranging from only a few days during 1922 to over a month (December 24, 1924, to February 6, 1925, Compl. Exhibit 90), during the winter season 1924–25.

LaRue, Water Supply Paper 556 (Compl. Exhibit 62, pages 12–13), notes minimum temperatures of −32° F. at Greenriver, Utah, +7° F. at Hite, and an average of 102 days with temperatures below freezing.

During January, 1878, LaRue records (Compl. Exhibit 62, pages 12–13) the crossing of the Colorado River at Lees Ferry of loaded wagons and during January, 1886, the crossing of stock. On January 15, 1925, the ice at Lees Ferry was thick enough to support loaded animals.

The Master found (M. R. page 81, Exception 22), that ice was no serious impediment to navigation.

The evidence sustains the conclusion that in practically every year there will be 3 months when ice will interfere or prevent with the operation of boats. Many years the rivers are frozen over completely. The breaking up of the ice fills the rivers with floating ice cakes, long after the temperatures are above freezing. The net result of the ice is to close the rivers for any practical boating for about 100 days. When this period is considered in connection with the regular flood months of May, June, and the first half of July, the occasional floods of August and September, and the extremely low water of the fall and early spring, it appears that ice is an important element of the evidence of nonnavigability.

Reference is made to ice conditions in the record.[2]

Rapids, riffles, and cataracts

The Master found that evidence as to the characteristics of the Green River, above the town of Greenriver, Utah; of the Colorado River, above Castle Creek; and of the San Juan, above Chinle Creek, were not relevant as upon the questions of navigability of the stretches below. (M. R. 53, Exception 9.)

It is improper to limit the testimony in this respect. In order to determine the value of the rivers as highways of commerce, the whole river

[2] Baldwin (Abs. R., vol. 1, pp. 324–327); Hyde (Abs. R., vol. 1, p. 490); Zahn (Abs. R., vol. 1, p. 597); Bennett (Abs. R., vol. 2, p. 830); Chaffin (Abs. R., vol. 2, p. 850); Hyde (Abs. R., vol. 2, p. 864); Howland (Abs. R., vol. 2, 1165).

must be taken into consideration. This was done in *Brewer-Elliott Oil and Gas Company* v. *United States; St. Anthony Falls Water Power Company* v. *Board of Water Commissioners; Packer* v. *Bird; Oklahoma* v. *Texas, supra.*.

The various witnesses have given their own definitions of "rapids." The great majority have made no differentiation between little rapids, referred to by some as riffles, and the large rapids or cataracts. In general they have been described as obstructions to the flow of the water of sufficient size to either raise the water or contract the width of the channel causing waves and high velocities. Certain portions of the river have few, if any, rapids while in other stretches rapids predominate. For the purpose of clearness the rivers are divided into outstanding stretches as follows: (Sections where rapids predominate are shown on Compl. Exhibit 5, and tabulation in Compl. Exhibit 80.)

Green River

Green River, Wyoming, to Utah-Wyoming line.—Based upon Compl. Exhibit 10, sheets 45 and 46, the distance from Green River, Wyoming, to the Utah-Wyoming line is 65½ miles and the total drop 214 feet at a rate of 3.3 feet to the mile.

Flaming Gorge, Horseshoe Canyon, Kingfisher Canyon, Red Canyon, Browns Park.—Powell on his first expedition (Compl. Exhibit 51), notes many rapids, three of which required the boats to be either lined or portaged and an average progress of 13 miles per day.

Jones, topographer with the second Powell expedition (Compl. Exhibit 628), notes 14 rapids all in the canyon section above Browns Park, at four of which the boats were either lined or portaged. Their downstream progress was 8½ miles a day.

Lodore Canyon.—Powell's first expedition (Compl. Exhibit 51) records a downstream progress of 2½ miles a day with many rapids run, lined, or portaged, and boats capsized many times. Jones, topographer (Powell's second expedition), reports downstream progress of 2¾ miles a day with 16 rapids, of which only 4 were run and the remainder either lined or portaged. (Summary Compl. Exhibit 628; Photographs 262 to 265, Compl. Exhibit 11–B.)

Whirlpool Canyon, Island Park, Split Mountain Canyon, Uintah Valley.—Jones, topographer (Powell second expedition), reports 19 rapids in this stretch, all in the canyon section, at 8 of which the boats were lined. Their average downstream progress was 8¾ miles a day in the canyon section and 26½ miles a day in the valley section (summary, Compl. Exhibit 628). Powell on the first expedition reports many rapids in the canyon section at which boats were lined (Compl. Exhibit 51; Photograph 272, Compl. Exhibit 11B).

Desolation Canyon, Gray Canyon.—Jones notes 118 rapids in Desolation and Gray Canyons at which it was necessary to line the boats 32 times. Their average downstream progress was 7½ miles a day. Powell notes many rapids and many times the boats were either lined or portaged. (Summary Compl. Ex-

hibits 51 and 628; Photographs 293 and 294, Compl. Exhibit 11B.)

Based upon the river-survey map of the U. S. Geological Survey (Compl. Exhibit 10, sheets 31 to 46) and the computations based thereon (Compl. Exhibit 80, pages 14 to 19), the Green River in the 439-mile stretch from its mouth to the Utah-Wyoming line, has 126 stretches where the average fall is at a rate of 33 feet to the mile and classified in Compl. Exhibit 80 as rapids; 67 stretches totaling 40½ miles where the average slope is 10.1 feet to the mile classified in Compl. Exhibit 80 as rapid water, and the remaining stretches having average slopes of between 1.4 and 3.0 feet to the mile, classified as quiet water. Jones (Compl. Exhibit 628) notes a total of 172 stretches which he characterizes as rapids with a total of 54 times when the boats were lined or portaged. (Photographs, Compl. Exhibits 116 to 120.)

Greenriver, Utah, to mouth of San Rafael.—(M. R. 18, Exception 4.) In the 22-mile stretch testimony regarding the number of rapids or riffles has varied between 14 as found by W. G. Hoyt (Compl. Exhibits 14 and 75) after field examination, and 12 by the Army Engineers' examination (maps shown on Compl. Exhibits 481 to 491 and in State Exhibit 18). Field notes of Stanton (Compl. Exhibit 176) notes two, at one of which three holes were stove in one of the boats. Diary of the second Powell expedition, by Jones (Compl. Exhibit No. 628), notes but one. There is no question but that since 1909 at least,

there have been between 12 and 14 small rapids or riffles depending somewhat on the stage of the water.

The characteristics of the river at these rapids or riffles are described in the record.[3]

Green River below Mouth of San Rafael River.—In this 95-mile stretch of the river, the slope is 1.17 feet to the mile and there are no rapids or riffles (Compl. Exhibit 80, page 12; photographs 116 to 140, Compl. Exhibit 77).

Summary of Fall Per Mile of Green River

UTAH-WYOMING LINE TO GREENRIVER, UTAH

	Miles	Fall per mile, feet
Rapids	20.72	32
Rapid Water	40.51	10.1
Quiet Water	260.45	2.84

GREENRIVER, UTAH, TO MOUTH

Rapids	22.3	.....
Quiet Water	95	1.17

Colorado River

Grand Junction, Colo., to Castle Creek.—In this 94½-mile stretch, as shown by Compl. Exhibit 10 and Compl. Exhibit 80, the river has an average slope of 5.8 feet to the mile with 21 stretches where the slope exceeds 15 feet to the mile, which have been characterized as rapids.

[3] Eddy (Abs. R. vol. 1, p. 5); Hoyt (Abs. R. vol. 1, pp. 32–35); Anderson (Abs. R. vol. 1, p. 198); Kolb (Abs. R. vol. 1, p. 214); Blake (Abs. R. vol. 1, pp. 252–254); Nims (Abs. R. vol. 1, p. 402); Dellenbaugh (Abs. R. vol. 1, p. 430); Clark (Abs. R. vol. 1, pp. 492–493); Kane (Abs. R. vol. 1, p. 590), and photographs 13 to 32 and 103 to 113, Compl. Exhibit 77.

Castle Creek to Moab.—In this 14-mile stretch, but more especially the upper 12-mile stretch between Castle Creek and Nigger Bill Creek, rapids are numerous. The average slope is considerably greater than the slope below Moab and in at least three places (See Compl. Exhibit 10, sheets 19 to 21, and Compl. Exhibit 80, pages 10, 11) the rate of fall per mile exceeds 10 feet. (Photographs 170, 171, Compl. Exhibit 77.)

Moab to mouth of Green.—In this 65-mile stretch there is only one place where the channel has been contracted sufficiently to cause an increase in the velocity comparable with a rapid, and this occurs at "The Slide" located on the Colorado 1.8 miles above the mouth of Green River. This slide has been described by various witnesses and the descriptions conform to that contained in Compl. Exhibit 75, page 70, and mapped in Compl. Exhibit 76; also in Compl. Exhibit 491, and Compl. Exhibit 490.

Mouth of Green River to Mille Crag Bend (Cataract Canyon).—In the 40-mile stretch occurs a series of rapids which were defined by Powell as cataracts. These rapids often occur so frequently that there is no open space between them; consequently, there is a somewhat wide range in the testimony as to the actual number. Hoyt, in Compl. Exhibit 80, page 3, shows 49 rapids at which the total drop is 302 feet and having an average fall at the rate of 33 feet to the mile. This exhibit is based on the river-survey profiles and number and location are con-

firmed by the topographic engineer (Chenoweth) who made the map. (Abs. R. vol. 2, p. 1002.)

R. B. Stanton, at the time of his survey for a railroad, noted 78 rapids, 36 of which were of such size that portage or lining of boats was required. (Summary Compl. Exhibit 176.)

Jones and Dellenbaugh (Compl. Exhibits 176 and 14), with the second Powell expedition, noted 62 rapids, of which 29 were of sufficient size to require lining or portage. The oral testimony of Kolb, Eddy, Lint, and others in the record, confirms the number of rapids and their magnitude:[4]

Mille Crag Bend to Lees Ferry (Narrow Canyon and Glen Canyon).—(M. R. p. 147, Exception 61) In the 176-mile stretch between the foot of Cataract Canyon at Mille Crag Bend and Lees Ferry there are stretches as shown by Compl. Exhibit 80, pages 7 and 8, totaling 21.31 miles, which have been characterized as rapid-water stretches. The diary of Jones (Compl. Exhibit 628) second Powell expedition, notes

[4] Eddy (Abs. R., vol. 1, pp. 8–14); Kolb (Abs. R., vol. 1, pp. 217–218, 230–232); Galloway's (Abs. R., vol. 1, pp. 293, 295–296, 298); Nims (Abs. R., vol. 1, p. 403); Lint (Abs. R., vol. 1, pp. 415–416); Dellenbaugh (Abs. R., vol. 1; pp. 432–433); Clark (Abs. R., vol. 1, p. 493); Stone (Abs. R., vol. 1, pp. 514–516); Rodin (Abs. R., vol. 1, p. 520); Edwards (Abs. R., vol. 1, pp. 562–563, 580–582); Kane (Abs. R., vol. 1, pp. 590–591); McDonald (Abs. R., vol. 1, pp. 607–608); Loper (Abs. R., vol. 1, p. 628); Chaffin (Abs. R., vol. 2, p. 855); Chenoweth (Abs. R., vol. 2, p. 1002). Photographs as follows: (Compl. Exhibit 239, No. 17), (Compl. Exhibit 241, No. 36), (Nos. 56 to 121, Compl. Exhibit 11B), (Photographs Compl. Exhibits 27 to 44), (Photographs Compl. Exhibits 105 to 114).

30 rapids, one of which required that the boats be eased through by hand; numerous groundings occurred. Dellenbaugh (Compl. Exhibit 14), of the same party, reports rapids and particular trouble at the bedrock section. Stanton (Compl. Exhibit 176) notes 15 rapids, at three of which the boats had to be lined or otherwise portaged. Oral testimony indicates that outstanding rapids occur as follows, listed in downstream order from North Wash (M. R. 20, 21; Exception 5):[5]

	Above Lees Ferry
	Mile
Trachyte Creek Rapid	161
Two-mile Creek Rapid	159.5
Four-mile Creek Rapid	158
Tickaboo Creek Rapid No. 1	148.5
Tickaboo Creek Rapid No. 2	148.5
Warm Springs Creek Rapid	136.5
Smith Rapid	132
Hanson Creek Rapid	129.8
Bullfrog Rapid	120.5
Unnamed rapid	116.8
Lake Canyon Rapid	113.2
Bed Rock Rapid	112
Shock Rapid	111
Whirlpool Rapid	104.6
Oak Creek Rapid	71.5
Aztec Creek or Bridge Creek Rapid	68.7
Last Chance	49.4

[5] Kolb (Abs. R., vol. 1, pp. 220–221); Galloway (Abs. R., vol. 1, pp. 291–292); Nims (Abs. R., vol. 1, p. 403); Dellenbaugh (Abs. R., vol. 1, pp. 433–434); Clark (Abs. R., vol. 1, p. 493); Stone (Abs. R., vol. 1, p. 507); Woodbury (Abs. R., vol. 1, p. 525); Kane (Abs. R., vol. 1, p. 588); McDonald (Abs. R., vol. 1, pp. 608, 612); Rust (Abs. R., vol. 1, p. 619); Loper (Abs. R., vol. 1, pp. 628–629, 634–635); Thomas (Abs. R., vol. 1, p. 645); Johnson (Abs. R., vol. 2, p. 796); Bennett (Abs. R., vol. 2, pp. 817, 820–822, 830–831); Chaffin (Abs. R., vol. 2, pp. 846, 849); Chenoweth (Abs. R., vol. 2, p. 1003); Stabler (Abs. R., vol. 2, pp. 1030–1031).

(M. R. 20, 21, 137. Exceptions 5, 56)

Colonel Dent (Abs. R. Vol. 1, pp. 350–356) records the following rapids and obstructions in Colorado River through Glen Canyon, based on observations made by him during early October, 1929:

Mile 160–161	Rapids.
159½	Do.
158¾	Do.
158	Do.
157	Swift and rough water.
150	Rapids with boulders and cobbles.
148½	Rapids with boulders.
132	Rapids with cobbles and small boulders.
129¾	Rapids.
113½	Do.
113	Do.
112½	Rapids with bad rocks.
109	Rapids.
108½	Do.
107½	Do.
105¾	Do.
104	Do.
103¼	Do.
74–78	Sand waves.
68½	Rapids.
63	Sand waves.
54	Do.
53	Do.
31½	Do.
25	Do.
22–25	Do.

Summary of Fall per Mile of Colorado River

COLORADO RIVER (GRAND), GRAND JUNCTION COLORADO TO MOUTH OF GREEN

	Miles	Fall per mile, feet
Rapids	16.59	15.9
Rapid Water	66.58	4.67
Quiet Water	88.93	1.13

MOUTH OF GREEN, TO LEES FERRY

Rapids	9.12	33
Rapid Water	45.56	4.3
Quiet Water	161.82	1.61

Velocity

Testimony relating to stream velocity is very apt to indicate wide differences. This is due to the fact that not only is there a very wide range in velocities throughout any cross section at any particular moment and a difference in velocity at every change in cross section and slope, even though the stream discharge remains constant, but also a change in velocity with every variation in flow. In other words, each change in volume of flow, slope of river, size or character of bed channel is accompanied by a change in velocity. Velocity characteristics can therefore be shown clearly only at sections where actual measurements of velocity have been made. These sections on the Colorado and Green, are limited to localities where stream gaging stations have been maintained by the U. S. Geological Survey, and for the rivers in question are located at:

Green River, near Greenriver, Utah.
Colorado River, near Cisco, Utah.
Colorado River, at Lees Ferry, Arizona.

The velocity characteristics at these stations, based on measurements by the U. S. Geological Survey, are shown in Compl. Exhibits 82 and 82–A by Hoyt. As stated in the report and oral testimony, gaging stations are, of necessity, located where riverbed conditions are as favorable as possible, and where, considering the river, velocities are low and uniform. The exhibits represent minimum or fair conditions and do not apply to any section where rapids, riffles, or contraction in the channel occur.

It was pointed out in oral testimony by Hoyt (Abs. R., vol. 1, pp. 86–97) that the velocities as shown for the Green River station near Greenriver, Utah, might be fairly indicative of velocities in the reasonably straight stretches of Green River located between the mouth of the San Rafael River and the mouth; that the velocities as shown for the Colorado River near Cisco, Utah, might be fairly indicative of like stretches of the Colorado River between Moab and the mouth of the Green, with the exception of the section at The Slide; that the velocities as shown at the Lees Ferry gaging station might be fairly indicative of velocities through the Glen Canyon section except at those stretches which, on account of excessive slopes or contraction resulting from bedrock or gravel and boulder obstructions at the mouths of streams or washes have been characterized as rapids or rapid water stretches.

Green River near Greenriver, Utah.—As shown on plate 2, Compl. Exhibit 82–A, the velocity in the thread of the current ranges from less than 2 miles an hour at extreme low-water period when the flow is 1,500 second-feet or less, to 8 miles an hour at flood stage. The approximate number of days in each year when velocities occur between these two extremes are shown on Plate 7, Compl. Exhibit 82–A, and indicate that for half the time the velocity exceeds 2.83 miles an hour and for half the time less.

At the various riffles or rapids above the mouth of the San Rafael the velocities were estimated by Hoyt (Compl. Exhibit 75) to be about 6 or 7 miles an

hour during a period having a volume of flow equivalent to about 2 miles an hour at the gaging station. Using the same ratio velocities at the rapids during flood stage would approximate and possibly exceed 20 miles an hour. The Army Engineers in State Exhibit 18 estimate velocities of 6 miles an hour during periods of fairly low flow.

Colorado River near Cisco, Utah.—As shown on Plate 2, Compl. Exhibit 82–A, the velocity in the thread of the current ranges from less than 1 mile an hour at extreme low-water period when the flow is about 1,500 second-feet, to 7 miles an hour at flood stage. As shown on Plate 7, Compl. Exhibit 82–A, the velocity exceeds 1.8 miles an hour for half of the time and is between 1.0 and 1.8 miles an hour for half the time. As heretofore stated these velocities may obtain approximately in the stretch from Moab to the mouth of the Green except at The Slide. Above Moab, they will not apply between Castle Creek and Nigger Bill Creek where the slope is much greater. Velocities at The Slide were sufficient, as brought out in oral testimony, to almost entirely retard the upstream progress of a boat propelled by a 14 horsepower engine (Blake Abs. R. Vol. 2, pp. 1332–1333) and at flood stage the velocity was such as to effectually prevent the *City of Moab* from going upstream. (Lumsden, Abs. R. Vol. 1, p. 182, and Anderson, Abs. R. Vol. 1, p. 200.)

Colorado River at Lees Ferry, Arizona.—As shown on Plate 5, Compl. Exhibit 82–A, the velocity in the

thread of the current ranges from 3 miles an hour during extreme low-water stage to 9½ miles an hour at flood stage. As shown on Plate 7, Compl. Exhibit 82–A, for half the time the velocities exceed 4½ miles an hour and for half the time range from 3 miles to 4½ miles an hour.

These velocities are fairly indicative of the velocities in the so-called quiet water stretches which are shown on page 7 of Compl. Exhibit 80 and located between miles 0 and 67.52, miles 68.72 and 100.17, miles 114.15 and 119.45, and miles 120 and 147.92, above Lees Ferry. Elsewhere the slopes are greater, the sections more contracted, and, under the laws of hydraulics, higher velocities must obtain. How much higher the velocities are can not be determined except by deduction. Almost without exception witnesses for the Government testified that rowing upstream in any stretch was practically impossible. If the average rate of rowing is 4 miles an hour, data already given show the slow progress that could be made upstream. Witnesses for the State testified that upstream progress was made by rowing and towing, an indication that velocities were probably in excess of 4 miles. Testimony by operators of motor boats showed slow upstream progress (Photograph 249, Compl. Exhibit 11–D), but it was not always possible to differentiate between retardation due to shoals and bars and retardation resulting from velocities alone. As shown in the testimony of Freeman (Abs. R. vol. 1, pp. 669–675), Marrs (Abs. R. vol. 1, p. 640), and

other power-boat operators, they could make little or no progress through rapids and rapid water stretches; and the testimony of Johnson, (Abs. R. vol. 2, p. 786) regarding the operation of the steamer *Chas. H. Spencer* shows that a brake in the form of a 100-foot chain was used while going downstream in order to make steering possible. Other indications of high velocities are shown by the testimony of State witness Fotheringham (Abs. R. vol. 2, p. 1270), relative to the inability to stop the dredge much short of Lees Ferry while they were making a move from one bar to another near the mouth of the San Juan River, and of the Second Powell expedition as related by Jones (Compl. Exhibit 628, diary for October 4, 1871), when in the bedrock section during low water one boat hit bottom with sufficient force to break it. All evidence seems to indicate that for considerable portion of the river higher velocities than are shown at Lees Ferry for corresponding stages obtained. Col. Dent (Abs. R. vol. 1, p. 363) testifies that in his judgment the only way a rowboat could have been taken upstream at the 19 rapids he noted in Glen Canyon, would be by dragging the boat by hand. Homer Hite (Abs. R. vol. 2, p. 913) states how 13 men took 26 days bringing launch and rowboats up through Glen Canyon.

Considerable evidence (Chaffin, Abs. R. vol. 2, p. 1368) was introduced by the State to the effect that rowboats have sailed up the Colorado River through portions of the canyon, including the

stretch of river in which rapids are located. Since the prevailing wind is from the southwest in this region and at times blows through the canyon section with terrific force, it is possible that a sail might provide sufficient force to counteract the downstream velocity (Photo. 40a, Compl. Exh. 77) even in the rapids.

Additional testimony showing velocities in Glen Canyon sufficient to retard upstream progress of boats is shown by the record.[6]

Variations of flow

(M. R. 85, Exception 25)

Roughly speaking, over 35,000 observations of daily flow have been made by the Geological Survey from 1895 to date on the Green, Colorado, and San Juan Rivers, at Lees Ferry and above. The results of these observations are shown on Compl. Exhibits 89 to 98. The actual daily variation in flow is shown graphically on plates making up Compl. Exhibit 79 and in tabular form in Compl. Exhibit 88.

It is obvious that in the brief only the high spots can be touched:

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[6] Aurand (Abs. R., vol. 1, p. 393); Clark (Abs. R., vol. 1, p. 262); Clark (Abs. R., vol. 1, p. 495); Gerdine (Abs. R., vol 1, p. 536); Edwards (Abs. R., vol. 1, p. 572); McDonald (Abs. R., vol. 1, p. 608); Marrs (Abs. R., vol. 1, p. 640); Freeman (Abs. R., vol. 1, p. 671); Johnson (Abs. R., vol. 2, p. 786); Bennett (Abs. R., vol. 2, p. 832); Chaffin (Abs. R., vol. 2, p. 846).

Green River at Greenriver, Utah (1895–1897, 1905–1928)

	Second-feet
Mean annual discharge	7,600
Minimum daily discharge	510
Maximum daily discharge	67,300
Ratio, maximum to minimum	132
Minimum mean month (November and December)	1,770
Maximum mean month (June)	26,200

Number of days in the year on the average the flow is below the mean discharge of 7,600 second-feet

January	31	July	13
February	27	August	27
March	26	September	28
April	16	October	30
May	1	November	30
June	1	December	31

Occurrence of floods—Average number of days in year flow exceeds

	10,000 second-feet	20,000 second-feet	30,000 second-feet
January	0	0	0
February	0	0	0
March	3	−1	−1
April	9	−1	0
May	27	14	5
June	28	18	11
July	14	3	1
August	−1	0	0
September	1	−1	0
October	−1	0	0
November	0	0	0
December	0	0	0

These records clearly demonstrate an extremely wide variation in flow, with low water occurring in all months except May, June, and July, during which three months 63.8 per cent of the total run-off occurs and with floods occurring in all the months except November, December, January, and February.

Colorado River near Cisco (1914–1917, 1923–1928)

	Second-feet
Mean annual discharge	9,660
Minimum daily discharge	866
Maximum daily discharge	73,200
Ratio, maximum to minimum	.84
Minimum mean month (January)	2,550
Maximum mean month (June)	34,300

Average number of days in the year the flow is less than the mean discharge of 9,660 second-feet

January	31	July	9
February	28	August	26
March	30	September	28
April	15	October	29
May	1	November	30
June	0	December	31

Occurrence of floods—Average number of days in year flow exceeds

	10,000 second-feet	20,000 second-feet	30,000 second-feet
January	0	0	0
February	0	0	0
March	−1	0	0
April	13	2	−1
May	30	22	13
June	30	27	16
July	13	3	1
August	4	0	0
September	+1	−1	0
October	+1	0	0
November	0	0	0
December	0	0	0

Sixty-five and three-tenths per cent of the total run-off occurs during the three months of May, June, and July. Floods are common during all months except November, December, January, and February, and periods of low water in all months except April to July.

Colorado River at Lees Ferry (1922-1928)

	Second-feet
Mean annual discharge	19,500
Minimum daily discharge	1,000
Maximum daily discharge	119,000
Ratio, maximum to minimum	119
Minimum mean month (January)	5,680
Maximum mean month (June)	62,400

Average number of days in year the flow is less than the mean discharge of 19,500 second-feet

January	31	July	10
February	28	August	26
March	28	September	24
April	15	October	29
May	0	November	29
June	0	December	31

Floods of 30,000 second-feet and over have occurred in all months except November, December, January, and February, and 60.8 per cent of the total run-off occurs in the three months, May, June, and July. Low-water flows of less than 6,000 second-feet have occurred in all months except March to July.

Richardson (Abs. R. vol. 2, p. 941), following observations extending over a year, says, "during that period, I observed that the stream (Green River) was one of erratic and irregular regimen."

Rapidity of change in flow

The Colorado, Green, and San Juan Rivers, in common with all rivers draining an arid or semiarid region, are subject to very sudden floods. The hydrographs of daily discharge (Compl. Exhibit 79) show vividly the rapidity with which the flow conditions change. A few of the more outstanding changes are shown in the Master's Report, p. 105, but Lees Ferry should be included.

From 181,000 second-feet June 18, 1921, to 28,100 on July 14.

From 16,000 second-feet August 17, 1921, to 64,100 on August 25.

From 12,500 second-feet April 22, 1922, to 119,000 on May 30.

From 9,310 second-feet September 18, 1923, to 47,800 on September 20.

From 119,000 second-feet July 1, 1927, to 17,700 on July 24.

From 14,400 second-feet September 9, 1927, to 110,000 on September 15.

The Master's conclusion that the sudden changes in stream flow has not constituted a marked impediment to navigation, is not sustained by the evidence. Specific incidents are few in number because the rivers were avoided in high water. The changes noted in the Master's report illustrate how the sand bars will be rearranged by sudden floods thereby interfering with the operation of boats. Evidence is unnecessary to prove the effect upon navigation, of such changes.

Green, September 26, 1928, from 1,680 second-feet to 19,800.

Colorado, September 9, 1928, from 14, 400-second-feet to 110,000, on September 15.

The number of violent changes could be multiplied. The ones quoted suffice to illustrate the effect upon practical navigation.

Fortier and Blaney, Technical Bulletin No. 67, Department of Agriculture (Compl. Exhibit 68, page 5):

> The greater part of the basin, and more particularly that part just below the mouth of Green River, is subject to sudden violent rainstorms and resulting floods erode and carry off the unprotected surface soils. Most of the storms deluge small areas and their erosive action is proportionally limited but occasionally extensive areas receive downpours causing floods in several streams which transport large quantities of débris.

Variation in depth

To a limited extent the variations in flow are an index to the variations in depths. In no sense do the conditions at gaging stations represent average conditions of depth (M. R. 98, Exception, 37, 38) of the rivers. The Master has attempted to arrive at depth by using a scaled width, but this is erroneous, because in his calculations he has failed to include the velocity. The velocity of the rivers changes with every stage of the water. Boulders, sand bars, and other obstructions change the slope of the water surface and increase the velocity. By his method of calculation the Master has arrived at a depth of 3 feet or over for more than 312 days each year. The error of this conclusion, if the Master intends that it apply to the section of the Green River in controversy (Exception 39), appears most pointedly when the experience of boatmen shows frequent groundings of row boats and light motor boats.

Average depth is not a factor in navigation. A table of stream flow records may show an average depth of 3 feet, but that is no benefit in determining the value of the stream for boats because such figures may be made up from depths ranging as low as six inches over bars and riffles.

The observations at the various gaging stations are the best evidence of variations in depth, and detailed studies are contained in Compl. Exhibit 82 and Compl. Exhibit 82–A from which the following conclusions are drawn:

Green River at Greenriver, Utah.—On Plate 2, Compl. Exhibit 82–A, it is shown that the mean depth at the gaging station varies from less than 3 feet with discharge of 2,000 second-feet to a mean depth of somewhat over 12 feet at flood stage of between 30,000 and 40,000 second-feet. As shown on Plate 9 the mean depth at the gaging station for half of the time is less than 4.2 feet and less than 3 feet for 53 days on the average each year, but these depths do not obtain over riffles or sand bars.

Depths in channel of Green River below Greenriver, Utah.—(Exceptions 26 and 39.) The detailed study of the physical characteristics of Green River (Compl. Exhibit 75) shows that during the periods of low and medium flow shallow depths were invariably encountered across the head of the various riffles above the mouth of the San Rafael and across shoals or bars which exist in straight stretches between

bends below the mouth of the San Rafael River. (M. R. 102.)

Jones, second Powell expedition (Compl. Exhibit 628), in diary for September 9, 1871, makes the following observation on conditions in Green River below the mouth of the San Rafael:

> Stopped raining, and we started again at 2.15 p. m. The river wide, still and very shallow * * * all the boats ran onto a sand bar. All were obliged to get out, the two boats in the rear were easily backed off. * * * The water grew more shallow until at last it was not more than 2 or 3 inches deep.

September 11, 1871:

> The water of the river so thick with sand and mud we could scarcely drink it. * * * Got fast on sand bars several times during the day.

September 14, 1871:

> We ran the entire length of Labyrinth Canyon and so far in this (Stillwater Canyon) finding nothing to stop us but *sand bars*.

September 15, 1871:

> We were obliged to wade over a sand bar to get our boats into the water of the latter stream (Green to Colorado).

Stanton records in Field Notes (Compl. Exhibit 176), May 25, 1889:

> 3.00 p. m. we started again. At 4 came to our first small rapid (may be Auger, Mile

112 above mouth WGH). Water shallow, rocks. *Denver* stuck on rocks and stove three holes in her bottom. All hands jumped into river and carried rest of fleet over safely. (M. R. p. 86, Exception 27.)

May 26, 1889:

Floated down river without incident except several very small rapids, all easy. Brown ran the *Ward* against gravel bottom in one shallow place; no damage.

Dent notes depths and groundings of a boat drawing about 2½ feet of water as follows in Stillwater Canyon near the mouth during investigations of September, 1929:

Miles above mouth:	Depth
0	4 feet.
½	Heavy grounding.
1⅓	5 feet.
1¾	Grounding.
2⅓	6 feet.
2½	+8 feet.
2¾	3 feet.
3	7 feet.
3½	Grounding.
3¾	4 feet.
4½	4 feet.
4¾	Grounding.
5	8 feet.

Took four hours to go the above 5 miles and waded around on bars looking for deep enough place to float the boat. (Exception 20.)

Additional testimony indicating shallow depths in Green River is contained in the record.[7]

Colorado River near Cisco, Utah.—(M. R. 101, Exception 40.) On Plate 3, Compl. Exhibit 82-A, it is shown that the mean depth at the gaging station varies from less than 3 feet when the discharge is about 2,000 second-feet to mean depths of 20 feet with flood flows of 60,000 to 70,000 second-feet. As shown on Plate 9, Compl. Exhibit 82-A, the mean depth for half the time is less than 3.8 feet.

For reasons previously stated these records apply only to the cross section at the Cisco gaging station.

Moab to mouth of Green River.—Testimony by W. G. Hoyt (Abs. R. vol. 1, p. 26), based on observations described on pages 73 and 74, Exhibit 75, indicates that the deepest part in cross section at the following locations was, in general, less than 2.5 feet during the period, October 18 to 23, 1928: Miles

[7] Hoyt (Abs. R. vol. 1, p. 26); Lunsden (Abs. R. vol. 1, p. 181); Anderson (Abs. R. vol. 1, p. 199); Kolb (Abs. R. vol. 1, p. 214); Blake (Abs. R. vol. 1, p. 252); Galloways (Abs. R. vol. 1, pp. 291, 301); Baldwin (Abs. R. vol. 1, p. 312); Aurand (Abs. R. vol. 1, p. 392); Lint (Abs. R. vol. 1, p. 413); Dellenbaugh (Abs. R. vol. 1, p. 431); Clark (Abs. R. vol. 1, p. 492); Stone (Abs. R. vol. 1, p. 512); Rodin (Abs R. vol. 1, p. 520); Woodbury (Abs. R. vol. 1, pp. 523); Edwards (Abs. R. vol. 1, p. 561); Kane (Abs. R. vol. 1, p. 588); Sawyer (Abs. R. vol. 1, p. 600); McDonald (Abs. R. vol. 1, p. 607); Loper (Abs. R. vol. 1, p. 623); Bennett (Abs. R. vol. 2, p. 826); Newby (Abs. R. vol. 2, p. 838); Yokey (Abs. R. vol. 2, p. 868); Reeside (Abs. R. vol. 2, p. 876); Nye (Abs. R. vol. 1, p. 105); Ross (Abs. R. vol. 2, p. 1055); (Photographs as follows: Compl. Exh. 77, Nos. 22, 23, 26, 31, 32, 111).

3.5, 4, 4.9, 7.8, 10, 11.8, 14, 16.5, 19.5, 21, 21.5, 22, 28, 29.5, 31.8, 33.8, 36.5, 39, 40, 43, 46.5, 48.5, 49.5, 50, 50.6, 53.9, 54.2, 54.4, 55.5, 56, 57, 59, 61, 62.8, 64.4, and 64.8 above the mouth of the Green River.

Testimony by Col. Dent (Abs. R. vol. 1, p. 328, Exceptions 20, 42) indicates that when he made his examination beginning August 25, 1929, depths were such that boats drawing about 2½ feet grounded at the following locations when the flow was about 6,000 second-feet (according to page 37, Exhibit 88, on the average there are 228 days in the year when the flow is less than 6,000 second-feet): Miles 64¾, 64, 63, 57¾, 57¼, 57, 56⅓, 55½, 54½, 53¾, 53, 49½, 46, 43½, 43, 41½, 41, 40¼, 40, 35, 34, 32½, 28½, 27, 25, 24½, 23, 22¼, 21⅓, 21, 19¾, 19½, 19, 17½, 16½, 15¾, 14¾, 14½, 13¾, 12, 11½, 10¾, 9⅔, 8⅔, 8, 7½, 4, 1¾, 1⅓, above the month of the Green River.

Shaw (Abs. R. vol. 2, p. 922) notes frequent groundings with boat drawing between 6 inches and 8 inches of water.

Testimony by Virgil Baldwin (Abs. R. vol. 1, p. 307) and numerous others, as listed below, indicates that the depths are so shallow that boats drawing less than 2½ feet frequently ground.

The Master quotes at length (M. R. pp. 101–103) from Lieut. Leeds' Survey (61st Cong., 2nd Sess., House Doc. 953). With reference to the trip contained in this report by Hughes in November, 1908, the water on the Colorado (Grand) was flowing 3,500 cubic feet per second. At this stage Hughes found crossing depths of between 2½ and 3 feet, but

failed to note the locations. Hoyt, with about 4,000 second feet, noted 36 places between the mouth of the Green and Moab of less than 2½ feet of water (Compl. Exh. 75, pp. 73, 74, Appendix to brief, p. 125). Over a period of years, the months of January, February, March, November, and December will show less discharge than Hoyt had, and hence his trip can not be said to have been at low stage of water. (Exception 41.) Colonel Dent, with a flow of 6,000 feet per second, noted 49 groundings on the same section of the river.

The depths found by Hoyt and Dent from actual measurements made at the time of the trip are as accurate as those of the Army engineers (M. R., p. 103), and this is especially true because it is confirmed by actual boat trips made by many others.

The Master's observations with reference to depths at the gaging stations (M. R., p. 101, Exception 40) are average depths and, of course, can not govern to the exclusion of the conditions found by witnesses who were present on the rivers in boats.

The Master should also have noted that whatever opinion Leeds expressed with reference to navigation was contingent upon river improvement. (M. R., p. 103.)'

The detailed study of physical characteristics as contained in Compl. Exhibit 75 shows that the most common depths at the bends and between the bars is between 3 and 5 feet, while the depths across the

shoals and bars which extend across the river between the bends are between 1 and 2 feet.[8]

Channel depths in Cataract Canyon (M. R., pp. 149, 150, Exceptions 63, 64).—There has been no direct testimony with regard to depths in Cataract Canyon. The rowboats which have gone downstream through this stretch of water had drafts of between 6 inches and 18 inches. There was no evidence that these boats grounded between the rapids and it may therefore be assumed that channel depths between the rapids generally exceeded 18 inches. Evidence shows that the majority of rapids in Cataract Canyon have been formed by an accumulation of boulders and large rocks in the channel over and around which the water passes. It is evident that under such conditions depths may range from zero where the boulders stick out of the water to several feet between them. The velocity of the water is so great that the sand and gravel bars which predominate behind the riffles on the Green River are not formed in Cataract Canyon. The river is narrower and depths are therefore greater than in sections of the river upstream and downstream.

Channel depths in Glen Canyon (Exceptions 62, 63, 65).—Stanton's field notes (Compl. Exhibit 176) records the following indications of channel depths:

[8] Baker (Abs. R. vol. 1, p. 22); Blake (Abs. R. vol. 1, p. 248); Clark (Abs. R. vol. 1, p. 492); Galloways (Abs. R. vol. 1, p. 284; Baldwin (Abs. R. vol. 1, p. 307); Dobbin (Abs. R. vol. 1, p. 370); Aurand (Abs. R. vol. 1, p. 385); Cleary (Abs. R. vol. 2, p. 749; Edwards (Abs. R. vol. 2, p. 767); Dugan (Abs. R. vol. 2, p. 775); Reeside (Abs. R. vol. 2, p. 875); Nye (Abs. R. vol. 2, p. 1050).

December 10, 1889:

> * * * At about 2.15 we came to Trachyte rapid (161 miles above Lees Ferry WGH) * * * McDonald was entirely undecided which channel to take. * * * Started down the center channel. We had not gone more than 200 feet when we commenced bumping on the rocks, and in a few moments we were stranded. Boats 2 and 3 were close behind us and went bumping over the rocks, but did not stick.

December 13, 1889:

> Just above California Bar going over riffle (Mile 130 WGH) our boat and No. 2 swamped on the rocks.

December 14, 1889:

> To-day the water was so low we got through with great difficulty. No. 1 went through without touching, but No. 2 struck several times, and No. 3 stuck on the rocks. We then found a mess of shallow water formed by flat shelves of rock running across the river and downstream for half a mile. (Mile 112.) We found the water so shallow that we could not get our boats through loaded—made portage of 800 feet. Mac and Gibson run the boats through light. * * *

December 15, 1889:

> * * * They found we could not get our boats through loaded over the half-mile shoal below.

December 16, 1889:

> * * * commenced our portage at 7 a. m. * * * distance of portage 2,475 feet—started 10.45, at 12 M. came to head of long shoal which on last summer's trip (July, 1889) was simply swift water. We started our boats with only three men in to make them lighter. No. 1 went through the first three-fourths mile without grounding, but No. 2 and No. 3 both grounded on gravel and worked for some time to get off. Succeeding at last all hands got aboard, and we started down the remaining three-fourths mile. In about 1,200 feet all boats got stuck on flat shelf of rock and after various efforts with two men in the water we got under way again at 3 p. m. Below this, 1½ miles of shoal. This work is very hard and fatiguing. These shoals seem to occur now where we had simply swift water before * * *.

Jones, with the second Powell expedition, notes in his diary (Compl. Exhibit 628):

October 2, 1871:

> Started again at 1 p. m. and ran 11 miles. Ran five shallow rapids, on one of which the *Emma* stuck, the *Nellie* twice. (Mile 158 to 168 above Lees Ferry.)

October 3, 1871:

> Ran nine small rapids, most of them long with small waves and some quite shallow, * * * ran three long shallow rapids, getting aground once. (Mile 124 to 152 above Lees Ferry.)

October 4, 1871:

> Broke camp at 7.50 a. m. and pulled out steadily for about 8½ miles, when we came to a long shallow; wound slowly along among the rocks, striking occasionally, until at last the *Emma Dean* hung on the bottom, and soon the *Nellie Powell* was fast. All hands in the water most of the time for an hour, making little more than a mile. * * * Continued to find shoals with rock bottom; current usually slow, but sometimes quite swift. In one of these places the *Nellie* struck with such force as to break a board in the center cabin.

October 5, 1871:

> running 5 rapids, 2 big ones at the head of one *Nellie* got aground.

Dellenbaugh in "A Canyon Voyage" (Exhibit 14) describes similar shallow depths.

Compl. Exhibit 619, page 119, *Annual Report U. S. Coast and Geodetic Survey, 1922.*—Kolb (Abs. R. vol. 1, p. 214); Galloway (Abs. R. vol. 1, p. 291); Nims (Abs. R. vol. 1, p. 401); Lint (Abs. R. vol. 1, p. 408); Clark (Abs. R. vol. 1, p. 492); Stone (Abs. R. vol. 1, p. 503); Rodin (Abs. R. vol. 1, p. 520); Gerdine (Abs. R. vol. 1, p. 534); Edwards (Abs. R. vol. 1, p. 555); Kane (Abs. R. vol. 1, p. 587); McDonald (Abs. R. vol. 1, p. 604); Allen (Abs. R. vol. 1, p. 613); Rust (Abs. R. vol. 1, p. 616); Loper (Abs. R. vol. 1, p. 627); Mars (Abs. R. vol. 1, p. 638); Thomas (Abs. R. vol. 1, p. 644); Barnes (Abs. R. vol. 1, p. 655); Freeman

(Abs. R. vol. 1, p. 660); Johnson (Abs. R. vol. 2, p. 1352); Palmer (Abs. R. vol. 2, p. 807); Miser (Abs. R. vol. 2, p. 948); Stabler (Abs. R. vol. 2, p. 1029), all describe the shallow conditions at rapids and shoals. Testimony of both Dent and Hoyt showed that in silt-laden rivers, such as the Colorado, Green, and San Juan, bars or shoals would form in straight stretches between the bends, across which there might be no channel. That this is true of the rivers in question was amply shown by many competent witnesses.

Dent noted frequent groundings a part of which were recorded as follows: Between North Wash and Lees Ferry in early September, 1929, the boat he was using ran smoothly where depths were 1½ feet and greater and dragged at lower depths miles —134¼, 126, 124, 108½, 46¼, 36.

Silt and sediment.

(M. R., pp. 81, 82, 88, 89. Exceptions 23, 30, 31)

In discussing the formation and transportation of silt and sediment in the Colorado, and Green Rivers, consideration must be given to the climatic and topographic conditions existing in their basins. The region is distinctly arid and therefore there is little plant life to act as a protective blanket to the surface. Consequently, the precipitation, which often occurs in the form of heavy downpour, runs off rapidly and carries with it soil which later appears in the rivers as sediment.

The extent of the erosive action of the water is evidenced by the fact that only remnants of the Colo-

rado River plateau remain. Each gully, wash, and canyon, is muto evidence of erosion and topographic features of all grades show the influence of aridity.

Besides the material brought into the river by side tributaries or blown in by the wind (Photo Exhibit 20), the river's own powers of erosion are a source of sediment supply caused by gradually wearing away their rock walls or undermining their banks.

As a result of these conditions the Colorado River system carries more suspended matter per square mile of drainage area than any other river in the United States. (Denudation by R. B. Doyle and H. Stabler, pages 78 to 93, U. S. Water Supply Paper No. 234, Government Printing Office, 1909.)

Green River.—According to Fortier and Blaney (Compl. Exhibit 68, page 17) as digested by Hoyt (Compl. Exhibit 75, pages 76, 77), the amount of silt carried past Green River in *suspension* during the 12-month period August, 1914, to July, 1915, was 8,332,900 *tons*. This is exclusive of sediment brought in by Saleratus Wash and San Rafael River and includes *no bed load*.

C. S. Howard (Abs. R. vol. 2, p. 974), based on much more complete information than was available to Fortier and Blaney, estimates that during the period October 1, 1928, to September 30, 1929, the Green River carried 50,700,000 tons of sediment in suspension.

Colorado River near Moab.—According to Fortier and Blaney (Compl. Exhibit 68, page 17), as digested by Hoyt (Compl. Exhibit 75, page 77), the amount

of silt carried past the gaging station on Colorado River near Cisco in *suspension* during the *nine*-month period November, 1914, to July, 1915, was 9,110,000 *tons*. This is exclusive of sediment carried by Court House Wash, Mill Creek, and other washes and includes *no bed load*.

C. S. Howard (Abs. R., vol. 2, p. 974), based on much more complete basic information than was available to Fortier and Blaney, estimates that during the 12 months ending September 30, 1929, the Colorado River carried 25,000,000 tons of suspended matter.

At Lees Ferry.—C. S. Howard (Abs. R., vol. 2, p. 975) estimates that during the 12 months ending September 30, 1929, 131,000,000 tons of suspended matter was carried in Colorado River past Lees Ferry.

Silt, General (M. R. 81, 82; Exception 23).—The estimates by Howard and Love (Abs. R., vol. 2, p. 970) being based on actual measurements made by the U. S. Geological Survey for the purpose of determining the actual quantities of sediment, are as accurate as any that can be made.

Although to date the laws governing the habits of silt-laden streams have not been well established, their characteristics are fairly well known. It has been established quite definitely that the higher the velocities in the stream the more sediment will be carried in the channel, and vice versa, and also that the amount of sediment transported has a relation to the size and character of the sediment and the

shape of the channel. As pointed out by Howard (Abs. R., vol. 2, p. 970), there is no uniformity in the rate of movement of the sediment or in its distribution in the cross section. As a result of these conditions there is a variation in the amount carried past any particular point ranging from a few thousand tons per day to as much as 20,000,000 tons a day. (Love, Abs. R., vol. 2, p. 979.) This is the natural result of the wide range in channel velocities shown to exist and which result in a continual process of scour and fill; a building up of bars in one place and tearing down in another; a sorting and redistributing of the millions of tons of sediment; a movement at times in the form of sand waves of the entire bed of the stream. These conditions account for the unstability of the beds of the Colorado and Green Rivers.

Unstable channel

Evidence shows that with respect to sand bars and gravel bars the rivers divide into fairly definite sections where one or the other predominates. On the Green River above the mouth of San Rafael, the bars are gravel almost without exception. Below the mouth of the San Rafael the river bed is in sand and silt without exception. On the Colorado River gravel bars occur in the short stretch between Castle Creek and Nigger Bill Creek and frequently at the mouths of creeks, drains, and washes in the Glen Canyon section. Elsewhere, excluding the Cataract Canyon section and the section where bedrock is near the surface, the bed of the river is sand

and sediment. As Howard points out (Abs. R., vol. 2, p. 970), there is a continuous change taking place in the beds of rivers having sandy beds.

In the cataract section of the Colorado velocities are apparently such that the only sediment in the river bed consists of large boulders.

It is a well-known scientific fact that flowing water is capable of moving sediment ranging in size from the finest débris to large boulders. The method of movement varies; fine material is carried in suspension; medium-sized material slides or makes short skips; the larger rocks and boulders roll. (Howard and Love, Abs. R., vol. 2, p. 970.) On the Colorado and San Juan Rivers the movement of sediment may take place in the form of waves. The character and amount of material which will move depend primarily upon the velocity, the size, and amount of the sediment, and, to a limited extent, upon the shape of the channel. (Howard, Abs. R., vol. 2, p. 970.)

It is clearly evident that the Green, Colorado, and San Juan Rivers can not have stable or permanent channels since their beds are composed of sand, silt, and sediment of varying degrees of fineness and channel velocities range from 1 or 2 miles an hour to over 10 miles an hour. Scientific deduction leads to this conclusion. The conclusion is supported by actual observations, technical and otherwise, as follows:

Greenriver, Utah, to mouth of San Rafael.—The unstability of the bed at the Green River gaging station is shown on Plate IV, Compl. Exhibit 76. A few cross sections show change over half the width of the river averaging 8 inches to over 1 foot and in the other half of the section changes of 4 feet and averaging 2 feet.

The text of Compl. Exhibit 75 and plates of Compl. Exhibit 76, when taken in connection with the Army Engineers' surveys, Compl. Exhibit 480 to 489 and 490A show radical changes have taken place between 1909 and 1928 in channel conditions at the various bars and riffles and also that there has been a decided increase in the flood channel of the river. See also testimony relative to changing condition of Green River, by Dent. (Abs. R. vol. 1, p. 343.) For evidence of unstable conditions of bank see photographs in Compl. Exhibit 77, as follows: 1, 4, 5, 6, 7, 8, 9, 14, 16, 17, 19, 21, 22, 27, 33, 33A, 101, 102, 108, 109. In other words, except where the channel abuts against rock or rock talus, there is little or no permanency in either bed or banks of Green River between Greenriver, Utah, and the mouth of the San Rafael.

Oral testimony by State witnesses tended to show that the only changeability in channel occurred at bars formed at the mouths of side streams and washes and at these localities conditions soon become normal when the river has washed the débris away. In connection with this testimony it

should be noted that according to Compl. Exhibit 75 only the following bars and riffles are the result of débris washed in by side drainage:

Name:	Location (miles from mouth)
Browns Bar	117.1
Auger	112.5
Halverson	108.5
San Rafael	94.9

Surveys and comparisons show that not only are these bars not permanent (except as to general location) but that the other bars, namely, Mohre, Two-mile, Butterfly, Farrer, Cable, Crossing, Mile 109, Mile 106.7, Gimlet, Sunaba, Second Anvil, and First Anvil, which have not been formed by side washes, are not permanent except as to general location. As an indication of the magnitude of bars which may temporarily be formed by side drainage, Wolverton (Abs. R. vol. 2, p. 1389) testified for the State that at the mouth of Indian Creek on the Colorado a bar was formed by side drainage which backed the water up 5 or 6 miles. The slope of the river at this point is such that a dam 6 feet high must have been thrown up extending across the river.

Green River: Mouth of San Rafael to mouth.

Colorado River: Moab to Lees Ferry.

Throughout the oral testimony the word bar was used loosely and in general without definition. The attention of this Court is called to the following discussion of bars from Compl. Exhibit 75, pages 63 to 76, which describes actual conditions in Green and Colorado Rivers and scientific reasons therefor. (See also Dent Abs. R. vol. 1, p. 329.)

Bars

General.—As indicated by the large-scale surveys (Compl. Exhibit 76) the principal permanent features of the Green River are its rock walls. These walls, however, are rarely closer than 1,500 to 2,000 feet; therefore, the river although in canyon has considerable freedom of action and meanders in an alluvial channel, cutting the banks where they are exposed to the thrust of the current and building up bars where the velocities diminish. The river is constantly shifting, sorting, and redistributing the enormous volumes of silt and sediment brought into it in suspension and bed load.

The bed of the Green River between the San Rafael River and its mouth and the Colorado River from the mouth of the Green River to Moab was found to be sand of various degrees of fineness. As is to be expected in a river flowing in a bed composed of fine material, the bed, although most irregular, had characteristics which are common to channels in unstable material. Within the limits of the rock walls the river is flowing in a channel unstable as to bed and banks, but at the same time having certain prominent features, such as side bars and crossing bars, which are common to all rivers flowing in alluvial material. The crossing bars are probably the most troublesome as far as depth and permanency of channel are concerned. Since these crossing bars are for the most part submerged, it is practically impossible to map them. Although all

rivers naturally seek meandering courses, with resultant swifter current and well-defined channels next to the concave shore, if they are to arrive finally at a destination, reverse curves are necessary. With few exceptions crossing bars are coincident with all such reversals.

It is apparent that the reversal of the current from one bank to the other is the primary cause of crossing bars. (Photo 5, Compl. Exhibit 145.) These bars extend across the river diagonally and average in length from 1,000 feet to more than 3,000 feet. It is evident that when the river is at flood stage the channel is full from bank to bank. Velocities in the cross sections are, however, known to vary within wide limits, even where the cross section is regular and the channel straight. Each change in the cross section or direction of the river is attended by a redistribution of velocities in the cross section and a change in the direction of the thread of maximum velocities. These changes in velocity give rise to the formation of whirlpools, eddies, and backwater, with the resultant decrease in the velocity and a partial or complete deposition of sediment carried in suspension or as bed load. When the direction of current is changed as a result of a reversal of curvature of the channel, there is change in the distribution of velocities. The thread of maximum velocity which, as a result of centrifugal force, follows the concave bank is diverted diagonally across the channel and downstream. The reduction in the velocities parallel to the thread of the current is apparently sufficient to

cause a complete or partial deposition of load resulting in the building up of long diagonal bars (Photo No. 16, Compl. Exhibit 145), paralleling approximately the thread of the velocity (Dent, Abs. R. vol. 1, p. 343). The assumption that these crossing bars more especially those composed of the finer materials, are continually changing their size, shape, and location is logical when it is considered that not only does the position of the thread of the current change appreciably with each change in flow, but also during low stages when changes in flow are minor, the material cut from the lower side bars drifts along to be deposited in the wider cross sections at the crossing bars. Dent says:

> This bar (crossing) would ordinarily be built up during any freshet. It will occupy the same general position each year, but its form may be entirely different from year to year.

The bars which form along the inside of the bends, the general character of which has been shown by large-scale surveys (Compl. Exhibit 76), fall in three general types. *First*, the bars that are partially awash during low-water periods; *second*, extensive sand bars having an average height of 4 to 6 feet above the water; and *third*, the willow-covered bars and benches ranging 12 to 15 feet in height.

The bars that are practically awash at the lower stages are the result of the lowering of the velocity in the cross section next to the inside of the bends

resulting from eddies and backwater. The material making up these bars is so fine that their surfaces can be seen to be in constant motion. The particles shift and move around with the smallest disturbances in the water. The material in these bars is so fine that the pressure of the little finger was frequently sufficient to sink out of sight the 8-foot sounding rod which was one-half inch in diameter. It is clearly evident that these portions of the river bed are, accurately speaking, in a constant state of change caused by all changes in velocity due either to change in stage or ripples and waves caused by wind.

The sand bars which lie between 4 and 6 feet above the water are apparently formed during ordinary floods. Between such floods they are subject to minor changes as a result of the gradual washing away of their edges where exposed to the current, the gradual building along their downstream slopes, and surface changes resulting from wind movement. It is Hoyt's conclusion that (Compl. Exhibit 75, page 67) many of the changes occurring at the crossing bars during low and medium stages are a result of the gradual wearing away of these low bars. The formation of the higher willow-covered bars or benches is not so easily analyzed. These bars or benches, which extend probably for one-half the distance through the canyon, form the flood channel limits for all except the most extraordinary floods. It is evident that they are composed of sediment brought into the canyon section, and their height

above the normal water surface indicates that such deposits could have been laid down only during the most extreme floods. All ordinary floods cut these banks rather than add to their height. It seems evident, therefore, that these enormous flats or, in reality, bars, many of which contain from 1 to 5 million cubic yards, are the result of extreme floods and that except for side cutting and surface erosion they are fairly permanent for long periods of time. Their presence may also be explained as a result of a change in flow conditions resulting from changes in climate. In the canyon sections we therefore have three degrees of permanency:

First, the bed of the low-flow channel of which the crossing bars are a part which, to speak accurately, is constantly shifting as the result of a rearrangement of the finer materials of which it is made up and of the constant addition of material brought into the section both in suspension and as bed load.

Second, the sand bars which lie from 1 to 5 feet above the water at low-flow stages and which are fairly permanent for periods between ordinary high-water stages. Such minor changes as take place consist of the gradual cutting and sloughing off along the edges and changes in surface configuration due to wind.

Third, the large willow-covered flats which are permanent for long periods between exceptionally high floods except for spasmodic cutting along their edges during ordinary flood periods and by surface erosion.

Photographs as follows show the nature of the exposed bed, bars, and banks from which it can be seen that conditions can not be permanent:

Compl. Exhibit 77, photos. Nos. 37, 38, 42, 48, 49, 54, 55, 58, 61, 62, 64, 116, 118, 119, 120, 121, 122, 123, 124, 125, 127, 128, 129, 130, 131, 132, 134, 135, 137, 138, 139, 140.

Compl. Exhibit No. 10, the plan and profile show that in this stretch the average slope is only 1.17 feet to the mile.

It is evident that at times the velocities are so low that large quantities of sediment shown to be carried by Green River past Greenriver, Utah, are temporarily deposited in the river bed. Scientific and other testimony shows that such deposits occur primarily along the insides of bends and in the straight stretches between bends. The reason for this has already been described, based on studies by Hoyt, in Compl. Exhibit 75, and by oral testimony of Colonel Dent and others, and is a subject on which most students of river hydraulics agree. Testimony offered by the State attempted to prove that with frequent operation of boats a channel could be maintained through these bars. Such a contention is contrary to scientific observations. Richardson states (Abs. R., vol. 2, p. 937) it looked to him as if the entire bottom of Green River was moving out.

Additional testimony showing the shifting character of the bed of Green River is contained in the record: [9]

Colorado River from the mouth of the Green River to Moab.—Except at The Slide and perhaps one or two isolated localities, the Colorado River between Moab and the mouth of the Green River flows in a canyon fill of unconsolidated shifting sand and silt. (Compl. Exhibit 75.) The limits of horizontal shift are fixed by the adjacent rock walls and talus slopes, but between these limits the river meanders similarly to the Green. Any one of the bars shown on Plates 30 to 33 (Compl. Exhibit 76) could, with a few changes in general dimensions, be used to illustrate bars along the Colorado. Roughly, there are about 2.7 acres of low exposed sand bars to the mile along the Colorado compared to about 1.4 acres to the mile along the Green below the San Rafael. This ratio would probably hold true for the submerged crossing bars. All side and crossing bars are noted with appropriate symbols on the river survey maps, Plates 44, 45, and 46 (Compl. Exhibit 78). Outstanding bars with shallow depths were observed at Mile 3.5, 4.9, 7.8, 10, 11.8, 14, 16.5, 19.5, 21, 21.5, 22, 28,

[9] Hoyt (Abs. R., vol. 1, p. 26); Lumsden (Abs. R., vol. 1, p. 179); Kolb (Abs. R., vol. 1, p. 206); Blake (Abs. R., vol. 1, p. 248); Galloway (Abs. R., vol. 1, p. 284); Edwards (Abs. R., vol. 1, p. 555); Sawyer (Abs. R., vol. 1, p. 599); McDonald (Abs. R., vol. 1, p. 604); Loper (Abs. R., vol. 1, p. 623); Newby (Abs. R., vol. 2, p. 837); Yokey (Abs. R., vol. 2, p. 868); Richardson (Abs. R., vol. 2, p. 929); Hoyt (Abs. R., vol. 1, p. 26); Ross (Abs. R., vol. 2, p. 1055).

29.5, 31.8, 33.8, 36.5, 39, 40, 43, 46.5, 48.5, 49.5, 50, 50.6, 53.9, 54.2, 54.4, 55.5, 56, 57, 59, 61, 62, 62.8, 64.4, and 64.8. Most of these bars are in straight stretches of the river and there is every reason to believe that under the same flow conditions they maintain about their same relative position. However, long periods of uniform flow are unusual and with variable flow the unstable condition of crossing bars previously discussed will prevail. Without exception the channel depths across these bars are shallow. The most common channel depths at the bends and between the bars ranged from 3 to 5 feet.

The drainage area tributary to the Colorado River below Moab is approximately twice as large as the area contributing to the Green below the mouth of the San Rafael. Courthouse Wash and Mill Creek, discharging into the Colorado River in the vicinity of Moab, and Kane Spring Wash, Lockhart Creek, Indian Creek, Salt Creek, and Red Lake Canyon coming in below Moab, all drain extensive areas subject to erosion. The load carried by these tributaries during floods may have produced a considerable amount of the canyon fill, because there is indication that during such periods they may fill channels 100 feet wide and 10 feet or more deep with a velocity sufficient to roll and otherwise move large boulders.

Photographs as follows show the nature of the exposed bed, bars, and banks between Moab and the mouth of the Green River:

Compl. Exhibit 77, Photographs Nos. 70, 71, 75, 77, 84, 86, 150, 151, 153, 155, 156, 158, 160, 163, 165, 167, 168. A complete description of the temporary nature of the typical side sand bar is described on page 71, Compl. Exhibit 75, and plate 36 of Compl. Exhibit 76.

Testimony of Virgil Baldwin (Abs. R. vol. 1, p. 307), who has made more boat trips on Colorado River below Moab than all the rest of the witnesses put together, shows that conditions on the Colorado River are similar to that already described on the Green River and that the river throughout, except at The Slide, flows over unstable, shifting, unconsolidated mass of sand and silt so spread out that the channel, if any, is obscured.

Dent (Abs. R. vol. 1, p. 328) describes the Colorado River as very changeable between its rock walls.

Richardson (Abs. R. vol. 2, p. 936) describes shifting character of the bed of Colorado River at its junction with the Green River.

Additional testimony with reference to the shifting character of the bed of the Colorado River downstream from Moab is contained in the record.[10]

Colorado River

Through Cataract Canyon.—No evidence has been introduced to show that there is decided shifting of river bed in this stretch. Kolb, who has been through

[10] Hoyt (Abs. R. vol. 1, p. 26); Prommel (Abs. R. vol. 1, p. 268); Baldwin (Abs. R. vol. 1, p. 307); Galloway (Abs. R. vol. 1, p. 284); Cleary (Abs. R. vol. 2, p. 749); Edwards (Abs. R. vol. 2, p. 767); Dugan (Abs. R. vol. 2, p. 775); Ross (Abs. R. vol. 2, p. 1055); Baldwin (Abs. R. vol. 1, p. 307).

this stretch twice, testified to always looking each rapid over before running it the second time, since there is often a rearrangement of the boulders and rocks in the rapids. No one person had made a sufficient number of trips or observations in Cataract Canyon to be in a position to testify conclusively that changes of great magnitude occur in the cataract section.

Glen Canyon Section (Exceptions 60, 62, 63, 64, 65).—The most exact information relative to the shifting character of the bed of Colorado River in the Glen Canyon section, except at those sections where gravel bars or bedrock occur, is contained on Plate II–A and Plate III–A of Compl. Exhibit 82A. These cross sections are based on actual observations of depth made by engineers of the U. S. Geological Survey in connection with their determination of daily discharge. They show conclusively that scour and fill amounting to as much as 17 feet has occurred in the river bed and that the average scour and fill across the entire cross section has amounted to 12 feet. Plate III–A especially shows the rapidity with which the river has scoured as shown by a change of 5 feet in two days.

Col. Dent, Loper, Rust, Stanton, and others have also described the sand waves on the Colorado River especially below the mouth of the San Juan River (M. R., p. 141, Exception 59). Their description by Stanton following observation made below

Lees Ferry, February 25, 1890 (Compl. Exhibit 176), is especially illuminating:

> February 25, 1890, 2.30 p. m. Look ahead thinking we saw a rapid. We start at 2.38 and again stop at 2.41 to see great rapid ahead, and when we get to it find only rolling waves. When we stopped to look ahead at 2.30 p. m. we thought we saw a bad rapid ahead on left side. When we got ahead a little on shore there was nothing in sight but swift smooth water.
>
> We started ahead again and ran 5 minutes when all three of us, Hislop, Travers, and myself, saw again a heavy rapid with breaking waves ahead. We land with great difficulty and walk down the talus, but there is no rapid. We walk ahead ½ mile to where the waves are breaking, and, after studying them for some time, find that it is an immense body of water moving down the river from what we suppose to be a great cloudburst above. We watch them carefully and the waves rise up gradually as they move down the river to 12 to 15 feet high, and the whole width of the river (150 to 200 feet wide), and then break upstream just as a huge breaker at sea. A half dozen of these rise and roll, break with a great roar, and then they subside and the water settles down. The same movement is repeated a little distance down and then further and further. Now they begin again opposite us and the whole operation is gone through with again. This occurs

> at regular intervals, and as these waves are of such force, the bends in the river so sharp, and the current so swift on account of the rise, it is difficult to land to see the rapids ahead. I fear we may be drawn into one of these swells just as we approach a rapid, and, unable to get out of it, be carried over the rapid with it. This, I believe, would be utter destruction to the boat and the men's lives. Hence, I conclude to stop where we are till morning, believing that the "tidal wave" will subside and not thinking it right to run such a risk without more thought.
>
> It is hard to imagine the force and grandeur of this phenomena. The greatness of the stream, the height and width of the waves, the narrow canyon, the towering walls, our perfect helplessness on the water, our boats like little chips tossed from one side to the other, turned round and round and perfectly unmanageable, and it is something to inspire awe and caution. We go into camp 91 on the right bank.

Hite (Abs. R. vol. 2, p. 915) describes the building up and washing away of bars in a few hours by the rising and falling water.

Chenoweth (Abs. R. vol. 2, p. 996), in oral testimony, showed where a bar at the mouth of Halls Creek sufficient to form a rapid with a 5-foot drop, had disappeared entirely between July and September, 1921. Oral testimony by Loper and others in the record as follows, who are most familiar with the

character of the river bed, shows that changes of large magnitude frequently occur.[11]

In his conclusion the Master has given consideration to those obstructions which are dangerous to life and limb (M. R. 97), and injects an element which does not appear in any of the decided cases. Most certainly the common obstructions which prevent practical navigation are those which are not dangerous and which are calculable in advance (Exceptions 34, 35, 36). As in *Oklahoma* v. *Texas*, *supra* the sand bars of the Green and Colorado in Utah are continuous, and the foregoing testimony amply demonstrates that sand bar trouble prevents the use of the rivers for practical commerce.

Boats on Green and Colorado Rivers

The Green River

(M. R., pp. 58–72)

1889, Sept., Ross—(M. R. p. 58, Ab. R. Vol. 2, pp. 1055–1056:)

Boat drew 5 or 7 inches of water with load; between Greenriver and San Rafael had difficulty in getting over shallow gravel bars; not smooth sailing; had to stop and navigate by different methods; when hung up on bars got out and pushed off; the

[11] Blake (Abs. R. Vol. 1, p. 248); Clark (Abs. R. Vol. 1, p. 492); Stone (Abs. R. Vol. 1, p. 503); Edwards (Abs. R. Vol. 1, p. 555); McDonald (Abs. R. Vol. 1, p. 604); Rust (Abs. R. Vol. 1, p. 619); Loper (Abs. R. Vol. 1, pp. 627–628); Freeman (Abs. R. Vol. 1, pp. 674, 677, 683); Johnson (Abs. R. Vol. 2, p. 1352); Bennett (Abs. R. Vol. 2, p. 826); Chaffin (Abs. R. Vol. 2, p. 845); Chenoweth (Abs. R. Vol. 2, p. 996); Fowler (Abs. R. Vol. 2, p. 1003).

boats were brought back upstream rowing and towing. (R. 4198.)

1891, July, McDonald—(M. R. p. 58, Ab. R. Vol. 1, p. 610. Edwards—(M. R. p. 58; Ab. R. Vol. 1, pp. 560–565). Kane—(M. R. p. 58, Ab. R. Vol. 1, pp. 587–592:)

McDonald could not find channel in same place as on first Stanton expedition; channel disappeared somewhere else; had same trouble on bars frequently between Greenriver and the cataracts; the channel in the Colorado River not as bad or changable as on the Green; sand is moving all the time; tried backing off bars with oars, but oars went down in sand so far had hard time to get them out; more water in river when first trip made; than when second Stanton trip was made; the ledge in Glen Canyon extends from one side of river to the other, water averages there six or eight inches deep; ledge extends down river 75 to 100 yards encountered Bull Frog and Trachyte Rapids in same canyon. (R. 2197–2198.)

Edwards had rough going at Devil's Auger; from there on down encountered riffles; river bed there mostly rocky, boulders and rocks all through channel; grounded some; when got to Wheeler ranch decided not safe to take all provisions through Cataract Canyon; from Wheeler ranch through Labyrinth and Stillwater Canyons hard to tell where channel crosses; they were on sand bars quite a lot; their boats grounded; got off by wading and pushing boats off with oars, or by rocking boats; from mouth of Green to cataracts no difficulty (R. pp. 1904–

1909); wore life preservers while on rivers; from end of Cataract Canyon to Hite, one or two bad rapids; got through pretty wet; river swift; from Hite river had fallen; (August) grounded on bars. (R. 1913–1914.)

Kane testified from Greenriver to mouth of Green River bothered good deal shallow water making delays and hard work; encountered good many channels, scattered out; stuck on bars; mouth of Green to cataracts swift water (R. 2001–2005); Glen Canyon sand bars not so bad as in previous December; had more water; end of Cataract to Lees Ferry pretty good water; one rapid Dark Canyon; two rough ones in Narrow Canyon; rapids in Glen Canyon due to shallow water; Tickaboo rapid swift and shallow; Trachyte rapid worst; boats dragged several times; in swift water have to row to beat current to steer boats at all; shoved and hauled boats in Glen Canyon below Tickaboo Bar; made one portage half mile long sooner than pull and haul and lift boats; walked across river at that point; there are reefs or ledges in the river, with breaks in them from few to 10 or 15 ft. (R. 2012–2017).

1891, March, April, 1892, 1893, Edwards.—(M. R. p. 58, Ab. R. vol. 1, pp. 566–570.)

Major Powell (boat).—Plenty of difficulty with sand bars; to get off used block and tackle; sometimes dig it out; come to places could not get through would reverse the boat and back down; run the propellers backwards to tear out sand; had no capstan; sand bar trouble continued to mouth of Green;

turned around mile above cataract; trip upstream not quite as hard because could back off bars and try other places; marked channel going down where they had trouble, got no results from it because channel had changed before got back; got boat back to Wheeler ranch, but could not go to Greenriver not possible to get up there, too much rock and rough water. (R. 1920–1922.) Ten days after made another trip to same place; took about three weeks to make it, evenly divided down and up; river had risen it shifted the bars; had to find channel the same as on first trip; had about same trouble coming back as on first trip; quite serious trouble getting out of Colorado River; Grand (Colorado) River had some flood; their boat not strong enough to pull them out; used block and tackle lining along shore; left boat at Wheeler's ranch; could not get it up to Greenriver. (R. 1922–1924.)

1892, August, Hite.—(M. R. p. 59, Ab. R. vol. 2, pp. 907–911:)

Boat used drew 4 to 6 inches; two cows unloaded because water too shallow; at Wheeler's ranch loaded them on again, and just below boat got stuck and they had to be taken off again; got on sand bars. (R 3588–3603.)

1893, July; 1893, Sept., Nov.; 1893–1905, Ross.—(M. R. p. 59), Ab. R. vol. 2, p. 1055:)

Draft 5 or 6 inches; water higher; got along well because of light draft; sand bars encountered, but pushed off; sometimes got out in water to get off bars; went back upstream in another boat, rowed

and towed; another trip in September; hit bars, can not read them all the time, this trouble with bars invariably happens; could only get back to Wimmer's ranch; could not get to Greenriver because too heavily loaded. (R. 4198–4205.) He towed and rowed to get back up to Greenriver, coming back alone from Wimmer's ranch to Greenriver; in November, 1893, on trip made two groundings between Greenriver and mouth of San Rafael; below there water so shallow could not get boats over them, so got into water and pushed boat (R. 4205–4206); between that time and 1905 made other hunting trips in same type boats and had same troubles with them as already described (R. 4207–4208).

1900, Feb. 1901, Wolverton.—(M. R. p. 60, Ab. R. vol. 2, p. 1373:)

Upstream rowed and towed and towed over riffles. (R. 5331–5332.)

1901, Ross.—Had same experiences with rivers as on other trips. (R. 4208–4209.)

1901, 1902, Feb., May, Ross.—(M. R. 60, Ab. R. vol. 2, p. 1059:)

Half way from Greenriver to mouth San Rafael struck rock or boulder, broke hole in bottom, boat leaked badly, draft 12 to 14 inches loaded (R. 4210–4211); hit many sand bars all way down, to get off used snatch blocks and lines; at other places pushed off, got out of boat and used levers; in Labyrinth Canyon sometimes could pick channel, sometimes not; worked boat over shallow places; sometimes tied

up for several hours; sometimes make good headway; Stillwater Canyon practically same as Labyrinth, having frequent groundings; in going downstream if water looked shallow soundings made with stick; sometimes man sent ahead in row boat to hunt channel; between mouth of Green and Moab struck bars, water little swift. (R. 4210–4217.)

1902, 1905, 1914, Reeder.—(M. R. 61, 68. Abs. R. vol. 2, pp. 1238–1243:)

In going upstream rowed and towed. When wind favorable would rig up a sail; is familiar with rapids on the Green River; but never had to sail over them; got over them by towing his rowboat up through the Slide, (R. 4879.) Always plenty of water on the Green River for rowboat; would hit sand bars if not careful, but if he followed channel plenty of water for rowboat; no difficulties or obstructions in boating; traveled from head of Cataract up to Moab; about the same as the Green River (R. 4886–4887); he has got out in the water and pushed his sailboats off, once in a while (R. 4890); on trip with Wolverton with motor boat; never ran on to sand bars, nor did they strike any obstructions anywhere; Mr. Wolverton thought this rather unusual (R. 4890).

1903, Wolverton.—(M. R. 61, Abs. R. vol. 2, pp. 1374–1379, 1391–1393.)

No trouble with riffles or with current; boats damaged in ice; machinery taken out; got on and off sand bars (R. 5333–5354); longest on sand bar three minutes (R. 5354).

1903, Yokey.—(M. R. 61, Abs. R. vol. 2, pp. 868–875:)

Trips were made in rowboats; easy to find channel coming upstream. Going down, have a current of three miles faster; to get steerage way coming back, run slightly faster than the water to keep ahead of it and get steerage way, so had plenty of time to pick the channel; coming downstream, have trouble because you might come on to it too suddenly (R. 3447–3448) with a boat of a draft of 18″ must have 2 feet or more water; where river splits up in two or more channels had low water; you will not find it; if confined to one channel, get that much more water (R. 3422–3424). Between mouth of San Rafael and mouth of the Green River there are places where river spreads out and the water is shallow (R. 3426–3427); some times pretty hard to find channel (R. 3428); no channels to be found unless you get on the river when it is dropping or at medium stage (R. 3433–4339); when river is rising can not tell where bars will be; when the river falls, cuts out and spreads out and deposits a half mile further down (R. 3444–3445).

1904, Chaffin.—(M. R. 61, Ab. R. pp. 854–855, 858:)

Between Greenriver and mouth of San Rafael had rough water; from there downstream had lot of trouble finding channel to get through the mud; seemed to be no place to go; water shallow; river spread out; got through getting out of boat and pulling it; from mouth of Green up Colorado River and

return no trouble, except to get up streams had to row and pole and line boat; upon return went through cataracts without trouble (R. 3314–3319).

1905, Lumsden.—(M. R. 62–63, Ab. R. Vol. 1, pp. 179–188, Anderson, M. R. 62–63, Ab. R. Vol. 1, pp. 197–206:)

Lumsden.—Got on sand bar mouth San Rafael, held up 7 or 8 hours; boat released by use of bars, poles, shovels, block and tackle; had no control of boat at Corkscrew; encountered then great many obstacles to mouth of Green, rock in river, too, sand bars; great many hours spent getting off; returning up Green, had good deal of trouble; swift water all the way; sand bars; found some of channels went down, in others gone; sometimes took wrong channel, backed and tried another; skiff sent ahead of boat on downstream trip to locate channel, but could not do this upstream, river too swift (R. 664–676); damaged propellers coming upstream (R. 677).

Anderson.—Considerable trouble between Green-river and mouth San Rafael on sand and gravel bars; pushed boat over them on trip with skiff to survey river before taking down City of Moab; trouble launching boat because of mud taking two or three days to get out; had trouble at Ferry Riffle and others, too; all way down to mouth of Green encountered groundings many times; plenty water one minute ground the next; used capstan, shovels to get off bars; water came so fast through the Slide could not get through although had plenty of power for that sized boat for ordinary river navigation; on return

trip sand bars encountered all way up; broke propellers; had same troubles on second trip down as far as Valentine's Bottom, considerable getting back; just one sand bar after another; no defined channel; no dock; sand bars changing at all times, could not keep track of them. (R. 720–757.)

1906, Wolverton.—(M. R. 63, Ab. R. Vol. 2, pp. 1378, 1393–1394:)

Made one trip; then was experimenting; had constant strain dodging rocks, obstacles, sand bars, after Wheeler quit as pilot he was not always successful in dodging rocks and sand bars; might have used poles or oars; sand bars most troublesome in July and last of August. (R. 5402–5405.)

1906, 1907, 1912, Wimmer.—(M. R. 63, 70 Ab. R. Vol. 2, pp. 1196–1198, 1207, 1210, 1214, 1222:)

Run *Marguerite*, every time he wished except when ice in river; did not draw much empty; never had any trouble, never stuck on sand bar; always got through (R. 4735–4750, 4770–4771, 4782–4789, 4802–4804); all time on river with boats did not have to get out in water 25 times in aggregate (R. 4813–4814).

1907, Loper.—(M. R. 64, Ab. R. Vol. 1, pp. 627–628:)

Hit riffles below Greenriver, sand bars below mouth San Rafael in Labyrinth and Stillwater Canyons running aground (R. 2347–2348); channel spreads out; trouble because no channel to navigate; not possible to observe deepest water; many times no channel for rowboat; from Dirty Devil to Hite same old conditions; mouth North West bars, one little

channel (R. 2350–2355); pulled boat back up river from Stanton Dredge to Hite; towed 90% of time on trip (R. 2355).

1908, Stirling.—(M. R. 64, Ab. R. Vol. 2, pp. 1181, 1184:)

No trouble going downstream stage of water higher; quieter part of river is shallow. (R. 4681–4694.)

1908, Wolverton.—(M. R. 65, Ab. R. Vol. 2, pp. 1379–1381, 1396:)

Had difficulty at times with sand rolls (R. 5354); aside from engine trouble no other difficulty (R. 5355).

1908, 1909, 1910, Anderson.—(M. R. 65, Abs. R. vol. 2, pp. 1342–1347):

Rowed and towed up stream, using 100 foot of rope (R. 5235); has never had any trouble in his experiences on the Green and Colorado Rivers, except once touched a sand bar.

1909, June, July, August, Sept., Blake.—(M. R. 65–66, Abs. R. vol. 2, pp. 1332–1336, 1339):

No obstructions; got through without delay; water high, lots of drift wood so followed sides of channel; did not get stuck on sand bars (R. 5208–5212); had slow time on September trip getting through Slide; ran on rock; no damage (R. 5214–5216); had most difficulty between Greenriver bridge and Wimmer ranch (R. 5225); riffle just below bridge most difficult to navigate in low water (R. 5225).

1909, Sept., Oct., Stone.—(M. R. 66, Abs. R., vol. 1, pp. 508, 512–513, 516):

Boats grounded between Greenriver and mouth of San Rafael; experienced good deal of trouble from sand bars all along through Labyrinth Canyon; good deal of swift water between Greenriver and mouth of San Rafael; when boats hit bars would get out sometimes and pull boats over; sometimes rocked boats from side to side to get them loose; grounded from Labyrinth Canyon to cataracts (R. 1782–1783); below Cataract Canyon found patches of swift water; from Narrow Canyon to Lees Ferry grounded on sand bars; followed same practice of getting off; pushing where they could and going overboard where they could not do that (R. 1789).

1909 Sept., Newby—(M. R. 6, Abs. R. Vol. 2, p. 841:)

Got stuck a mile before they got to Wolverton's ranch; had to get out of boat, so made camp on shore; upstream between Bowknot Bend and Wolver's ranch encountered sand and gravel bars; from there to Greenriver encountered usual difficulties with sand and gravel bars. (R. 3253–3256.)

1909, Wimmer.—(M. R. 66, Abs. R. Vol. 2, pp. 1197, 1208, 1214:)

Never failed to go up river in Marguerite; never failed to get up any riffles only when had engine trouble; he was never stuck on a sand bar with it, (R. 4782–4784, 4802.)

1910, Baldwin.—(M. R. 67, Abs. R. Vol. 2, pp. 1298–1299:)

Did not have any trouble with sand bars to speak of, would hit once in a while a little bit; take pole or

oar and push right off; nice trip; carried poles to push off sand bars, (R. 5090–5091.)

1911, Kolb.—(M. R. 67, Abs. R. Vol. 1, pp. 214–216, 218–222:)

From Greenriver to Wolverton's ranch had swift water; numerous rocks, some project above water, most of them underneath; could drag oars and touch bottom; ran on riffles, on one or two instances boat stuck on rock and swung around (R. 787–788); had difficulty in Labyrinth Canyon with sand bars; frequently ran onto them; river spreads out, channel changes; some little trouble with sand bars in Stillwater Canyon (R. 787–791). In Narrow Canyon frequently got on a bar; had difficulty with groundings on sand bars or crossing bars (R. 796); in Glen Canyon experienced difficulty in grounding frequently; from mouth of San Juan down grounded frequently (R. 796); encountered rapids, riffles, large rocks close to surface of water; grounded frequently on the rocks, run onto sand bars down as far as Lees Ferry (R. 805–806); does not believe it possible to take boat upstream in Glen Canyon (R. 811).

1912, July, Aug., Tasker.—(M. R. 68, Abs. R. Vol. 2, 1407:)

On trip with Wolverton down the Green River. Didn't get on any sand bars, except one place (R. 5437); rowed and poled upstream, but not hung up on any sand bars going down; was hung up on a bar coming up (R. 5439); other boats used on surveying trips struck frequently, on bars (R. 5448–5449); if the wind is blowing and it is rough, it is hard to

determine the channel, but can usually find one without any difficulty (R. 5449).

1914, July, Loper.—(M. R. 68, Abs. R. Vol. 1, p. 631:)

Greenriver to Mouth San Rafael no trouble because of increase in flow of water; encounterd bar or two in Labyrinth Canyon; water at flood stage all of time on Green River. (R. 2373-2376.)

1914 August, Sept., Richardson.—(M. R. 68-69, Abs. R. Vol. 2, pp. 931-937:)

Grounded as they passed mouth of San Rafael on reconnaissance trip in launch of Capt. Yokey (R. 3678, 3686); river was running about fifteen to twenty thousand second feet of water (R. 3686), this was latter part of June, 1914; river was muddy; sand bars encountered; on return trip with power boat sand bars encountered (R. 3688); on trips found river shifting, unstable channel; very dangerous place to take drilling outfit; bedrock very deep under fine sand bottom of river; when water rises bottom of river scours, velocities increase greatly, making it dangerous for drill crew at the junction (R. 3692); every change in discharge of river, sand bars formed on one side and wash out of other; a short distance above junction seemed to him whole bottom of river was moving out; river had fair discharge, and had quite time getting first five or six miles up the Green River (R. 3692-3693); he was present when the drilling outfit was washed away, so ordered outfit to move out (R. 3694).

1914, Aug., Sept., Sawyer.—(M. R. 68, Abs. R., vol. 1, pp. 600–604:)

Scows taking drilling outfit down Green River grounded on sand bars; used block and tackle to get them off; shoving and reversing paddle wheel on *Marguerite* to get them free; wide shallow places in river; bars choked water off and shot it over against bank at bends; took work to keep outfit off rocks; all boats grounded frequently (R. 2099–2100); going back up Green River grounded on sand bars; encountered series of gravel bars, shallow fast water, not possible to bring outfit up over bars; unloaded at Wimmer's ranch (R. 2104–2115); lost 90 feet of drill rods and casing through flood (R. 2110–2111); sand bars continual occurrence on river; jumped into shallow water, pushed the barge off; barge drew very little water (R. 2117).

1915, Oct., Ross.—(M. R. 69, Abs. R., vol. 2, p. 1067:)

Had usual fair trip, hit and miss; bumped along on the shallow places; clear sailing between sand bars; coming back had as good trip as expected; got wet once in a while shoving off. (R. 4231.)

1919, Feb., Mendenhall.—(M. R. 69, Abs. R., vol. 2, p. 895:)

Usual kind of trip rowing and towing. (R. 3500–3504.)

1921, Sept., Frantz.—(M. R. 69, Abs. R., vol. 2, pp. 1175–1180:)

Low water; no trouble going down or coming up; hit one sand bar, delayed four or five minutes; never

operated power boat before; never been on river before. (R. 4655–4658, 4670–4672.)

1921, Sept., Chenoweth.—(M. R. 70; Abs. R. vol. 2, p. 996).—Lint, Tasker, Kolb:

Chenoweth.—Between Greenriver and mouth of San Rafael, river was swift, full of rapids; no difficulties (R. 3888–3889); below mouth North Wash was a rapid (R. 3894–3895).

Lint (Abs. R. vol. 1, pp. 408–415, 417) encountered difficulties because of lots of shoals in Colorado River below mouth of Fremont River (R. 1470–1471); had sand waves (R. 1471); had to get out and wade to find channel (R. 1472); on trip from Greenriver had lots of shoals, sediment, new bars, rocks, several times necessary to get into water and push boats; between mouth of San Rafael to end of Labyrinth Canyon had more sand, more shoals than above; got out of boat and pushed; situation in Stillwater Canyon practically same as in Labyrinth; because of sediment, packing in pump lasted only about two hours; just above mouth of Green River hit some sand and broke propeller shaft of motor (R. 1479–1483); kept one man on lookout for channels (R. 1479); through Glen Canyon to Lees Ferry had shoals, sand bars, sand waves; ran into rapids in there, too (R. 1486–1488).

1924, Galloway.—(M. R. 70, Abs. R. vol. 1, p. 287, 292.)

Same difficulties from end of Cataract Canyon to Lees Ferry, except more water, river crowds against ledge; there is great big whirlpool (R. 1068–1069);

had no more difficulty in going from mouth of Dirty Devil to Lees Ferry than going from mouth of San Rafael to mouth of Green River; plenty parts of the river where even if careful will not be able to surmount the difficulty (R. 1107).

1926, Sept., Nye.—(M. R. 71, Abs. R., Vol. 2 pp. 1050–1055:)

Between Greenriver and mouth of San Rafael great deal of difficulty encountered because of numerous rapids, and were in water most of time trying to get boat down stream; took three days to get to that point; most trouble at mouth of San Rafael where necessary to wade up and down stream several times and drag boat over rocks and gravel to get down stream; difficult to find one continuous channel to float boat (R. 4183–4184); between San Rafael and mouth of Green encountered one riffle about 7 or 8 miles above the mouth of Green; great deal of trouble getting stuck on or avoiding sand bars; took 8 days to get to mouth of Green River from town of Greenriver (R. 4183); hardly hour passed but that necessary to get out and wade stream to find channel deep enough to float boat (R. 4184); from mouth of Green to Moab, had more water because of rain, so little trouble encountered; beyond the Slide had whirlpools, nothing serious; had considerable difficulty with sand bars (R. 4184–4185); had interlacing channels, would wade river find channel, float boat by dragging it across river, that channel would end, and then would have to wade some more (R. 4191).

1927, June, Galloway.—(M. R. 71, Abs. R., Vol. 1, pp. 298–304:).

Had high water; so didn't have so many rocks or so many sand bars to contend with (R. 1128–1129) but got stuck on some sand bars nearly every day (R. 1129).

1927, Nov., Clark, Rodin Woodbury.—(M. R. 71, Abs. R. Vol. 1, pp. 492–494):

Clark.—Between Greenriver and mouth of San Rafael encountered difficulties with riffles; dragged bottom; stuck on sand bars in shallow water fifteen or twenty minutes; got in water and shoved off (R. 1711–1712); from San Rafael to mouth of Green trouble with sand bars, stuck several times a day, got out in water and pushed off (R. 1712–1713); from end of cataracts to Lees Ferry had difficulties running onto bars; shallow water; boats hung up; difficulty with whirlpools; encountered riffles in Glen Canyon, water shallow; could have taken the boat back upstream from Lees Ferry to cataracts with proper equipment and six men (R. 1720).

1927, Blake.—(M. R. 71, Abs. R. Vol. 2, p 1339):

Got through Slide with boat, taking five minutes going through the hundred yards; never towed on the river (R. 5208); this was one of the highest water seasons in years (R. 5208); channel did not change so much from high water, but current changes at points where water struck an obstruction (R. 5220–5221); had the most difficulty in operating his boats between Greenriver, Utah, and Wimmer's ranch; riffle just below Greenriver bridge is most dangerous in low

stage of water (R. 5225). During his experience south of San Rafael and around Moab in the operation of boats he encountered sand bars (R. 5225–5226); he never got on the sand bars; he got pocketed once below Fort Bottom when running a race; carried nothing but oars to get off the sand bars (R. 5227).

Colorado River: Castle Creek to Moab
(M. R., pp. 73–75)

1888, Nov., Shafer.—(M. R. 73, Abs. R. Vol. 2, p. 1328:)

No trouble with raft; easier walking back up river from Moab, because of great amount of work in getting cargo back up river. (R. 5200–5202.)

1898, Aug., Henry Grimm.—(M. R. 73; Abs. R. Vol. 2, pp. 1325–1327:)

Rowed upstream through Nigger Bill and rapids. (R. 5180–5183.)

1907, Aug., Sept., W. E. Mendenhall.—(M. R. 73–74, Abs. R. Vol. 2, pp. 894–900:)

Rough water Moab to Richardson Valley at mouth of various washes; rapids mouth of Castle Creek and at Salt Wash. (R. 3492–3493; 3521–3522.)

1907, Oct., Coote.—(M. R. 74, Abs. R. Vol. 2, p. 1305:)

No difficulty except at mouth of the river that came in with a swift current. (R. 5113.)

1916, Aug., Kolb.—(M. R. 74, Abs. R. Vol. 1, pp. 242–244:)

Portages made in Westwater Canyon, around rapid; encountered swift, shallow water, commencing 20 miles below Cisco and continuing down to a

short distance above Moab; had difficulty with canoe in swift water. (R. 859–862).

Loper.—Testimony of Loper admitted to be the same as Kolb. (R. 2397. Abs. R. Vol. 1, p. 634.)

1926, Apr., May, John Galloway.—(M. R. 74, Abs. R. Vol. 1, p. 284:)

River is sluggish; shallow over riffles; had to row away back in places and pull boat back to find the channel.

Parley Galloway.—(M. R. 74, Abs. R. Vol. 1, pp. 300–303:)

Encountered sand bars; gravel bars; could not take boats up river from Moab to Westwater, but might do so for 15 miles by doing considerable towing; has never seen any boats on the river between Westwater and Moab. (R. 1132–1134.)

1924, C. E. Baldwin.—(M. R. 74, Abs. R. Vol. 2, p. 1295:)

This was a fishing trip; not much of a rapid at Nigger Bill, but some right above; has never tried to take the power boat above those riffles. (R. 5078.)

1928, Aug., Moore.—(M. R. 74, Abs. R. Vol. 1, p. 715:)

Went upstream five miles to rapids at Big Bend. Did not think it safe to take boat through (R. 2737); between Castle Creek and Big Bend found rapids (R. 2738).

1897–1898, 1902–1903, 1908, Branson. (M. R. 74–75.) (Abs. R. vol. 2, pp. 1190–1192.) Encountered submerged rocks; lost part of raft; did not remember any other people going up or down that

section of the river, between Castle Creek and Moab; some swift water and riffles between Castle Creek and Moab; got boats back up by towing along the bank; shallowest he ever saw the river on Nigger Bill riffle was waist deep to a 6-foot man (R. 4717–4721); got stuck on submerged rocks (Abs. R. vol. 2, p. 1192); never stuck on mud or sand bars, but mud got between boards and would make lumber soggy and heavy, and cause raft to draw more water (R. 4728); never had trouble with ice (R. 4729–4730); necessary to get in water and shake raft loose from rocks (R. 4731–4732).

Colorado River: Moab to the Junction

(M. R., pp. 75–80)

1896, 1926.—(M. R., p. 76:)

The Master refers to trips made by boats coming down from the town of Greenriver, Utah, to the Junction, and up the Grand to Moab, which he states are already described in connection with the Green River. (See Ross Abs. R., Vol. 2, p. 1059, Chaffin Abs. R., Vol. 2, p. 854, etc., Nye Abs. R., Vol. 2, p. 1050, Hoyt Abs. R., Vol. 1, p. 26.)

1920, Aug.—The Master refers to trips made by oil prospecting parties from Moab to the Junction, as reported in the "Times-Independent," August 19, 1920. (M. R., p. 76, Exhibit 460.)

1923, Aug.—(M. R., p. 76, Abs. R., Vol. 1, p. 307:)

Virgil Baldwin (Abs. R., Vol. 1, p. 308:)

Evinrude boat about 18 feet long, possibly 3½ or 4 feet wide, round bottom, drew about 10 inches of water. The Evinrude motor was hinged to the boat,

so that it could be set at an angle with the boat, or straight down, and when the motor hit sand bars it could be lifted off.

1925.—(M. R., p. 76:)

Moab Garage Company (Virgil Baldwin Abs. R., Vol. 1, p. 308) constructed a boat about 75 feet long, 14 or 15 feet wide, sides being 3-inch planks, and the bottom double planked. At first it had a square end front; afterwards a pointed bow was put on. It was first equipped with an automobile engine and then later with a Waukesha motor and a new paddle wheel. The boat drew about 18 inches of water light; when loaded it would possibly draw 21 inches.

(M. R. p. 77, Virgil Baldwin, Abs. R. vol. 1, p. 307:)

Operated a boat about 27 feet long, 5 feet wide, drew 10 inches of water with ordinary load. Powered with 6 cylinder automobile engine, with 1515 propeller. This was used for light work and some passengers were carried (M. R. p. 77, Abs. R. vol. 1, p. 307; Virgil Baldwin). The other boat was powered with a Ford motor, about 20 feet long, probably 4 feet wide, drawing possibly 6 or 8 inches of water. Equipped with a 14-inch propeller, with guard, making a 16-inch total draft. Prior to 1925 Baldwin had no experience operating boats on the Colorado River, except a trip or two with the Evinrude boat, when he went down the river on a hunting trip, but did not have much pleasure, because of difficulty in getting any place while in the boat. Would get stuck on a bar. If the propeller would happen to hit a rock or anything, it would shear off a pin

and not tear up the motor. This motor didn't work because of sand in river which would get around the pump and clog it up. After the big boat was launched, witness' brother, Clarence, had charge of the operation of the boat during the first trip. Witness had made a few trips down the river before that, so that they let him go ahead with the small Evinrude boat to help locate the deepest water. That is the way they got by without quite so much trouble.

On the first trip got stuck and didn't even have an anchor with them, in case they broke a chain or anything to hold their boat from drifting away from where they wanted it to go. Didn't have any steel cable with them and had inch manila rope line. Undertook to take that to shore. It just carried the rope downstream. Had quite a job getting back. Boat was stuck there for three hours before it got off. (Abs. R., vol. 1, p. 311.) On this trip it was necessary to take lines to shore in order to pull the boat into deep water. About 10 hours consumed making trip to Shafer No. 1 well, about 19 miles. (See also Abs. R., pp. 311-324.)

1924, Dec., John Dugan.—(M. R. p. 78, Abs. R., vol. 2, p. 775.)

Trip from mouth of Mill Creek down the river to what is known as Kane Creek structure, Shafer No. 1 well site. Evinrude outboard motor boat. Started at Mill Creek at daylight and returned after dark. A good deal of trouble with slush ice was encoun-

tered. No other trips between these points, on business for his Company.

1925, Aug.—Next trip was in row boat with outboard motor. Great deal of trouble was had with sand bars.

1926, Jan.—Next trip was in January, 1926, and in the same month and in February made trips with the Moab Garage barge. On the majority of the trips trouble was had with sand bars, making it necessary to use winches and tow lines in pulling the boat off the bars on the up trip. They generally got off the boat at the East side of the river, about 1½ miles or 2 miles away from camp and walked into Moab, instead of riding the boat, because it was quicker and saved time. During July and August, September and October, made a number of trips down to the mouth of Lockhart Canyon. A few times on the barge and the balance in a motor boat. Made about three trips up in the motor boat, which he operated himself. Observed that the channel changed very rapidly. Changes in the water level were rapid during July and August, especially when there were numerous thundershowers and freshets, and great trouble was had with the bars during this period. The greatest difficulty with his own boat was encountered coming upstream at points where the bars completely crossed the river, making shallow water all the way. Insufficient for a small boat. Being stuck on these sand bars was quite common, and it would be necessary to go out and wade across the stream with an oar, picking out where the water

might be a little bit deeper. Generally found place where water was a little deeper, but invariably it was necessary to drag the boat across, it being a question of working your way through. The water was only 8 or 10 inches deep. (Abs. R. vol. 2, p. 871.)

1911–1912, Seitz.—(M. R. 79, Abs. R. vol. 2, p. 1013:)

Made a topographic survey Colorado River from Grand Junction to the mouth of the Green. Used 2 flat boats, round bottoms, 14 feet long, 4 foot beam, drawing not more than 2 or 3 inches. Surveyed down to Castle Creek. Boats never loaded. Camp equipment moved in wagons. Boats were used in crossing the river in going down from one point to another. Did not go through Westwater Canyon. Boat was portaged through. Boats were not used between Castle Creek and Moab, being hauled to Moab in a wagon. On survey between Moab and mouth of Green used a boat which drew from 8 to 10 inches when loaded and when the survey was completed was not brought back upstream by the party.

Party did not return up the river in boats, because it was exceedingly slow work, it being necessary to tow the larger of the boats, and the food supply had run out.

1914.—(M. R. 79, Abs. R. vol. 2, p. 929:)

Richardson, Reclamation Engineer, engaged in investigating Junction dam site. Made several trips up the Grand from Junction but only one through

trip to Moab. This stretch of the river similar to the Green. Observed the river to be of irregular and erratic regimen. Considered The Slide as a distinct obstruction to navigation.

1926.—(M. R. 79, Abs. R. vol. 2, p. 876:)

Reeside, Geological Survey, made trip from Moab to the mouth of the Green, August, 1926, in a 16 foot boat, propelled by an Evinrude outboard motor. On this trip, boat grounded a number of times. He had to go out and wade around to find the best water, and would drag the boat in that direction. Had a particularly bad time at a place called Kane Creek, where he got out, waded 50 or 60 yards around the boat without finding deep enough water to float it. He and his companions by poling, pushing and lifting, edged the boat and waded 100 yards or more before reaching deep enough water to float the boat. Boat struck bottom many times on other occasions. (Abs. R. Vol. 1, p. 877.)

1926, Aug.—(M. R. 79, Abs. R. vol. 1, p. 370:)

Dobbin made trip in a 16 foot Evinrude Boat, August, 1926, with Reeside. Below the Moab dock, where the river makes a turn, had trouble with sand bars, both going down and coming up. Had difficulty where the stretches were straight. There were frequent groundings, off and on, all the time, from where they started until they reached the Junction of the river. In coming back they noticed a change in shifting sands in the river bottom. When the boat grounded, Reeside usually got out to hunt for deeper water. Compared bars to sand dunes on the

surface, sometimes the middle of the boat would be grounded on the top of the bar.

1929, Aug.—(M. R. 79, Abs. R. Vol. 1, p. 335:)

Lieutenant Colonel Dent, Army Engineer, made a trip in boat of the Moab Garage Company, 27 feet long, 5 feet beam, the boat, itself, drawing comparatively little water, but the propeller projected below the bottom and was protected by a scag. Boat drew more under full speed than under ordinary speed. When the water got to be about 2½ feet deep, it was necessary to slow the boat down to about half speed. When the depth got to be about 2 feet, the boat dragged, and when it got to about 1½ feet, it was necessary for some one to get out and help push and steer the boat. The boat was in charge of Thompson, connected with the Company. After leaving the landing at Moab, encountered a series of sand bars; tried one channel, backed out and tried another, in an effort to find deeper water. Tried both sides of the river in this case and eventually it was necessary to dig their way across the bar. Encountered other bars and groundings on the way down. During the trip many groundings were recorded, and the miles at which they occurred, were noted by the engineer. These were distributed throughout the entire stretch. No distinction was made between groundings and instances where the boat was stuck on the bars. The groundings were very frequent.

1926, May.—(M. R. 79, Abs. R. Vol. 1, p. 700:)

Kirkpatrick made trip in small launch of Moab Garage Company, in charge of an employee of the

Company. On return trip, broke propeller on a snag or rock and beached the boat for repairs. Again on the river in the Fall of 1926 from Moab to Well No. 2, with two rowboats 16 feet long, outboard motor, and the motor boat of the Moab Garage Company. Below Moab the boat stuck in the mud a good many times. Was again on the river in September, October, and November, 1926. Had sand bar trouble on all of the trips. Observed that the channel changed a good many times during three or four days. Returned upstream in November on the large barge of the Moab Garage Company, and the boat got stuck at Mill Creek and stayed all night. He, himself, went ashore, but the boat did not reach the dock until about 11 o'clock the following morning.

Colorado River: From Cataract Canyon to Boundary Line—Glen Canyon

(M. R. 127–137).

1888, Hite.—(M. R. 129, Abs. R. Vol. 2, p. 903:)

Delayed starting down until had sufficient water to float barge; this done so as to get over rapids (R. 3565–3566).

1889, Hite.—(M. R. 129, Abs. R. Vol. 2, pp. 902–911:)

Placer mining stopped in high water, extreme low water, and cold weather (R. 3575–3576); floods begin in April and end early in July; during July and August river very muddy, sometimes very low (R. 3573–3574); during September and October water usually low from then until following Spring,

except for rises by rains; during November and December river very low; ice in January, sometimes in November and December (R. 3576).

1897–1901, Bennett.—(M. R. 126; Abs. R. Vol. 2, pp. 829–832:)

Built 24 ft. tunnel propeller boat, which drew 16 inches (R. 3187–3188); the boat did not do very well, drew too much back water; water followed back upstream; it would sit down in water and drew water along behind it (R. 3188–3189); the trip in 1901 made with 3 rafts. Went downstream in high water, in June, the water being 12 to 14 feet above low water. (R. 3206–3207.)

1888, McDonald.—(M. R. 129. Abs. R. Vol. 1, pp. 607–613:)

From Hite down the river had trouble all the way; rocks, bars, shelf across river, nearly 100 yards in width; have to find opening in it to get boat through; the large rock, known as Bed Rock dam site, crosses the river 112 miles above Lees Ferry (R. 2177–2180); a few rapids were encountered in Glen Canyon; going downstream ran them; going upstream got out and hauled boat; Bull Frog rapid bad place (R. 2181); bad bars and rocks at Crossing of the Fathers; channel not as bad or changeable in Glen Canyon as on the Green, but sand is moving all the time; when tried to back off bars with use of oars, the oars went down so far in sand hard to get them out; his observations of Green and Colorado would say troubles and impediments traveling up or down on boats about the same on Green River between Green-

river and its mouth, as on Colorado between Cataract Canyon and Lees Ferry (R. 2196-2226).

1892 to 1908, Chaffin.—(M. R. 130, Abs. R. Vol. 2, pp. 846-854:)

On Colorado River below Cataract Canyon when going upstream rowed and towed, poled on trip in September, 1892 (R. 3270); when water is still can row, at rapids this can not be done, have to pull boat up, can not pole over them if you have big boat; generally waded over rapids and took boat up (R. 3274-3275); sometimes had no difficulty as on trip in May when water rising; this was in 1895 (R. 3277-3278); on other trips had trouble according to time of the year; after floods go down have some channel which lasts until some flood comes down some side canyon, which starts silt moving, and you can not go back the same way you came down when channel changes; might do so overnight (R. 3278); between Bull Flog and Hanson rapids got on rocks with raft; had two 24 ft. boats; this was in 1895; one boat loaded with iron broke, the other one sunk; river was too swift to get small boat up (R. 3280-3284); at Lake Canyon found water latter part of August was from nothing to over his head; had hard time getting raft off rocks at Lake Canyon, had to pry it with bars (R. 3285).

1888 to 1896, Hite.—(M. R. 131, Abs. R. Vol. 2, pp. 902-906:)

Trachyte and Tickaboo Rapids Nos. 1 and 2 considered bad (R. 3566-3567); placer miners and trappers came up river by towing boat; Aztec Rapids

considered the worst between the Cataracts and Lees Ferry, because very swift, shallow water, lots of boulders, no defined channel; in narrow places floods cause river to rise 75 to 80 feet above extreme low water; placer mining stopped in high water, extreme low water, and in cold weather (R. 3568-3576).

1895, Mendenhall.—(M. R. 131, Abs. R. vol. 2, pp. 892-893:)

Lost big boat on Colorado River in Spring of 1895; walked from California bar to Hite, some 35 or 40 miles up Colorado River, for his mail (R. 4282); in 1895 wind blowing so hard upstream had short, high, choppy waves; could not get through, so boats were tied up, and big boat became loose and was lost (R. 3487); portaged in going into Aztec Rapid, lined boats partially light (R. 3488-3490).

1898, Rust.—(M. R. 131, Abs. R. vol. 1, pp. 617-621:)

From Last Chance to Halls Crossing going up stream 60 miles in boats can row and tow, hard work; in 1898 took boats upstream by rowing and towing (R. 2257-2263); he selects small boats because they are easily and quickly managed to avoid sand bars, shoals, whirlpools; the wind waves drive boat ashore (R. 2272); between Crescent Creek and North Wash there are rapids; from Warm Creek to Lees Ferry water pretty swift (R. 2274); the reef or strata of rock runs cross stream 15 miles below Halls Crossing; he has had trouble there; it is called Reef Rapid or Shock Rapid; narrow channel 40 to 50 feet wide; channel not less than foot deep to right side (R. 2285); this ledge

with channel half mile long; light boats drawing 6 inches able to go over the rapid without striking bottom; rapid is rough, with rough waves (R. 2287–2291).

1897–1898, Sumner.—(M. R. 131, Abs. R. vol. 2, pp. 814–815:)

Has seen boats towed upstream; plenty of swift water between Olympia and Good Hope Bars; no other boats there except skiffs (R. 3122–3130).

1897 to 1920, Bennett.—(M. R. 131–132, Abs. R. vol. 2, pp. 826–837:)

Towing boats up river considered easiest way of getting up river (R. 3182); first motor boat tried on river was in 1902; it did not have power to go upstream over rapids; tried both stern and side wheels on boat; side wheel got caught on rocks because of swift water; could not hold boat; one side out-ran the other (R. 3183–3184); then tried 24-ft. boat, with tunnel propeller, stern had draft of 16 inches; equipped it with engine; the boat was not a success as it had too much back draft; it would sit down in the water and drew the water along behind it; last motor boat he used did not have sufficient power to overcome swift water (R. 3185–3189); between Good Hope and mouth of Warm Creek are a number of rapids; Bull Frog is a heavy rapids, life boat got stuck going through there; there are two places in Colorado River where a ledge runs across the river, one at Shock Rapids or Bar, where lifeboat was in difficulty, then they had to wade back and forth and finally found cracks.

in the bedrock, deep but not wide; four of them helped boat over the place; there is quite a reef further down on the river (R. 3197–3202); going upstream, intermediate water most acceptable, 4 or 5 feet above extreme low water; in high water, water runs out; can not get up against the current; in low water, there are too many shallow places; rocks stick up in river; sometimes buried, so ran on them and could not get off (R. 3205–3206); when rocks stick up in river; sometimes buried, so run on them and can not get off (R. 3205–3206); when he took the 5,000 pounds down river in 1901 he went down during high water; it was 12 or 14 feet above low water (R. 3206–3207); river shifts from time to time during high water or immediately after; obstruction causes current to run over and bore under it; shifts one-third or one-half the distance of river; the river works fast cutting banks out, and current causes whirls; going downstream can not always find the channel in the same place; changes from one side to the other of river; has known changes to occur between trips (R. 3207–3220); did not always reach his destination by river on account of the conditions of the river; on one trip in very high water worked nearly two days with three men but could not get up a certain point between Hite and Olympia Bar (R. 3230–3231); was on river working for 22 years, and greatest number of men there was in 1898 when Stanton Dredge was there, being 75 to 100, most of them living in tents (R. 3241).

1895 to 1901, Chaffin.—(M. R. 132, Abs. R. vol. 2 p. 1366:)

Rowed, towed and poled upstream; did some sailing; (R. 5307); in 1898 when he made trip with his brother in 20 ft. boat with 1,200 pounds supplies were not hung up on sand bars, rocks or rapids; never sailed up Shock Rapids without aid of pole or by towing, (R. 5312) he had no trouble with rafts, (R. 5315); the rafting was done during months of May and June in the high-water period (R. 5315–5317).

1897–1898, Johnson.—(M. R. 132–133, Abs. R. vol. 2, pp. 785–790:)

Stanton had four boats which were taken up river from Lees Ferry; one had motor, but it would not work; took fifteen men on the four boats to take them upstream; it took 21 days to go from Lees Ferry to Bull Frog Creek, about 135 miles (R. 3017–3018); encountered bars and rocks between rapids (R. 3018); has ridden on the *Violet Louise*, a 40-foot boat propelled with a 40 horse-power motor; it got loose in flood, he rescued it, and it was dragged back to camp, where it still is (R. 3023); on the Stanton trip in 1898 found better water below Warm Creek, as there were not so many rapids and swift waters there (R. 3027); going upstream rowed, towed and poled; when got on sand bar got out and pushed boat off (R. 3037–3038);

1898 to 1904, Chaffin.—(M. R. 134, Abs. R., vol. 2, pp. 1247–1253:)

Going upstream would row and tow and pole (R. 4912); built the *Lucy B*, 28 feet long; he took it to the Olympia Bar; he only got downstream with the boat (R. 4915–4916), had no difficulty going down (R. 4918); made one upstream trip with it to Good Hope, (R. 4919–4920); this was about 1902–1903; took engine out of it because of broken piston ring, and operated boat without it (R. 4922); made one or two trips then with it during summer 1902–1903 to Hanson Creek; going downstream never had any trouble with lack of water, or sand bars; swift water mouth of North Wash, and at mouth of Dirty Devil (R. 4925–4926); from Mill Creek Bend to Dark Canyon there is swift water and rapids (R. 4927); he has no recollection of getting out of boats into water going either up or down stream, but he has seen others do it a few times (R. 4952).

1907–1915, Loper.—(M. R. 134–135, Abs. R., vol. 1, pp. 627, 631, 634, 635.)

Poled boat back up river from Stanton Dredge to Hite, in November, 1907. Towed the boat 90 per cent of the time. (R. 2355.) Went from Hite to Lees Ferry in January, 1908; five days making the trip. Grounded several times; found serious rocks in Shock Rapids. There is a ledge of rock in the river at the mouth of Lake Canyon. (R. 2356.) Towed boat up from Lees Ferry to Hite; between 1907 and 1914 he lived on the Colorado River. Observed it at different stages of the water; channel changes at all

stages, except at high water. (R. 2363–2365.) During seven years' observation he was not able to follow or locate deep places in the river, had to hunt for channel (R. 2367); every change in the river volume means a rearrangement of the channel and sand bars; any change makes it a different river. Encountered sand bars below San Juan (R. 2370). In 1911 on a trip from Hite to Lees Ferry with Bert Seaboldt, ran on to rocks in Trachyte Rapids, and below Shock Rapids. Found a gravel reef (R. 2371); between North Wash and Red Canyon on trip in 1929, with a 16-foot boat, touched bottom with oars in lots of places. Trachyte Rapids is bad water; couldn't use motors; there is a gravel reef there that runs across the river (R. 2401); with twelve to fourteen thousand second-feet of water, touched rocks in Smith Fork Rapids. Dragged motor along on gravel above Lake Canyon (R. 4202); at Shock Rapids took the same channel he had taken before, but it proved to be the wrong one; severe rapids with four big rocks; zigzagged through there by inches (R. 3404).

1915, Wimmer.—(M. R. 135. Abs. R., Vol. 2, pp. 1200–1203:)

In the fall of 1921 operated boat at Halls Crossing; was a rowboat with Evinrude motor and went about 30 miles from Halls Crossing, in connection with the Chenoweth expedition. In going over Bull Frog rapid, would have to use oars to get over them. This was the last of August or the First of September. (R. 4756–4757.) In the Fall of 1929, he met the

California-Edison boat and it could not get up the river with its load. (R. 4762.) (Abs. R., vol 2, p. 1202.) In 1922 he had trouble going from Lees Ferry to Halls Crossing, getting past Aztec Canyon. The power of the motor was insufficient to overcome the current. They made it all right, but not without help. They were using 16 to 18 foot boats. (R. 4765-4768.) On the Colorado River, below Cataract Canyon, and from there on down, he had what might be called trouble just once. He was running a race with his son, and cut over and lodged on a sand bar. (R. 4785-4786).

(M. R. 136-137 Abs. R., Vol. 2, p. 1222.) There is a rapid at Halls Crossing; one at Shock Rapids, one at Bridge Canyon Rapid. (R. 4821-4822.) The current is stronger on the lower Colorado than on the Green, between the mouth of San Rafael and the mouth of the Green. (R. 4855-4856.)

1920, Bennett.—(M. R. 135-136. Abs. R., Vol. 2, p. 816:)

Built a raft, went downstream from Good Hope to Olympia Bar. The raft got hung up on a small bar. (R. 3134.) Below Lake Canyon Rapid there was a large whirlpool and his boat got into the whirlpool, in attempting to get out of the large waves, of the rapids. (R. 3135.) Below Lake Canyon Rapid, the water was too swift to row over. He climbed up ledge, they threw him a line and he pulled the boat over. Travelled 20 to 25 miles in two days, towing practically all of the distance upstream. When he got hung up on Shock Rapids, went down and loaded

the boat on an island at the end of the rapid. Then came back and tried to pry the raft off but couldn't. (R. 3747.) (Abs. R., Vol. 2, 820.) Had to get into the water to get the raft off the rapids. That bad stretch of water through there is possibly one-eighth of a mile long. (R. 3148.)

Freeman.—(M. R. 137. Abs. R., Vol. 2, p. 669.)

Going up from Lees Ferry to Halls Crossing in 1922, in a rowboat with outboard motor, made seven miles the first day and about the same distance the second day. (R. 2577.) Had trouble with sand bars. Would have to lighten boats to get them over the sand. (R. 2508.) Sand bars were less trouble on the upstream trip than on the downstream trip, when the river was low; were more troubled with the current. Occasionally got out and lifted the boats off of the sand bars. (R. 2584.) Ran on to a rock. (R. 2586–2587.) It took 12 days to go from Lees Ferry to Halls Crossing and about a week on the return trip. Abs. R., Vol. 1, p. 681. Observed differences in changes of channel between upstream and downstream trips. The rate of change is generally affected by the flow. (R. 2593 Abs. R., Vol. 1, p. 683.)

BOATS AND NAVIGATION FROM RECORDS IN OTHER CASES

Red River

Oklahoma v. *Texas* (258 U. S. 574)

In the testimony, very little is said respecting navigation upon Red River from Marshall County west, reference being made in the testimony of one witness regarding the area adjacent to Tillman

County, one of the westerly counties, that there has been no navigation on the river within his recollection, except people using boats for fishing and hunting only. (R. 1403.)

The testimony of another witness resident in Jefferson County refers to a ferryboat operated near Ryan. (R. 1486.)

Another witness referred to a ferryboat operated in Love County in Tp. 8 S., R. 2 W. (R. 1522.)

Upon the section of river adjacent to the counties from Marshall County eastward to the Arkansas line, there appears to have been considerable traffic at one time or another, and the testimony deals principally with these sections so far as boating history is concerned.

D. C. Tumey (R. 1550), 84 years of age, residing at Platter, Bryan County, Oklahoma, lived all his life in neighborhood of Preston, Texas. He stated that steamboats came up there before the war; one came to old Preston and stayed until spring; one went to the mouth of Big Mineral and stayed all winter; it came up on a rise in the river. One was stranded at Preston and stayed there all winter. The one that came up to Big Mineral had a saloon and groceries on it. The pilot house was torn off of the one that stayed at Preston, by the boat trying to run under a cable, and it had to stay until the pilot house was repaired. These boats came before the civil war. A keel boat came up and started up the Washita, but hit a rock about a mile up and was sunk.

The steamboats coming up the mouth of Big Mineral and Preston had boilers on them; they were loaded with dry goods, groceries, and whiskey; one went to the mouth of Big Mineral and stopped, staying all winter, selling groceries and dry goods to the people and in return took money, hides, buffalo robes, and country produce. By spring they pretty well sold out their stock of groceries and dry goods; they again came back to Preston with a heavily loaded boat, and sold groceries and whiskey there. The boat did not stay there but a little while. It was loaded with all kinds of furs and hides and went out in the spring.

Dan H. Collins, 40 years old, farmer, of Colbert, Oklahoma, who lived there all his life, saw the *Annie P.*, and the Government snag boats up there. (R. 1557.)

G. W. Webb, residence 1½ miles south of Achille, southern part of Bryan County, 4 miles from Red River. He had a gasoline boat down at Kiamichi on the river and tried to bring it up the river; it was 16 ft. wide and 36 ft. long; the bridge was 14 ft. wide and 20 ft. long. The boat drew 32″ of water and he did not find the water deep enough to bring it unless he could get a rise. He brought the boat up in 1908, and got it here on a rise in the river. The boat was built by one of the lumber companies to raft logs. He brought it up the river to use as a ferryboat.

R. P. Draper (R. 1567), County Surveyor, Choctaw County, Okla., 60 years old, lived in that county

since 1903; before that time resided in Lamar County, Texas, opposite Choctaw County, Okla., testified: The boat coming down the river in 1867 was the first one he knew of and that was in the fall or winter season. It was named the Cuba; it drew between 3½ and 4 feet when loaded. There were several boats since that time which he saw, the last navigation occurring in 1875. Since that time there have also been gasoline launches on the river. These gasoline boats were principally used for rafting timber; quite a lot of timber has been rafted down the river to different mills along the river; they generally happen to catch a rise; they could not do much in the ordinary stage of the river. There has been a good deal of logging on the river in his recollection. It was the custom to float these logs down the river to sawmills adjacent to the river. Some of them were even floated to Fulton, Arkansas, and below there even. Walnut logs were floated down the river; logging was quite a large industry in the Red River valley for a great many years, and floating and rafting the logs down the river was one of the usual and ordinary methods of carrying those logs to market.

After the invention of motor boats, these boats were used in shoving the rafts along; but that was not done extensively; it did not seem to be a success. They generally took advantage of the rises and rafted the logs down during a rise. The boat he spoke of as landing at Hickory Bluff Landing was a steamboat; it was carrying cotton for some point up the river. Up to the time the railroad came, a large portion of

the cotton grown on Red River was shipped out by steamboats or flat boats.

J. W. Threlkill (R. 1572), 60 years old, address Grant, Okla., lived nearly all his life near Red River in Oklahoma and Indian Territory. He testified that his recollection goes back to '71 or '72, when he was eleven year old. The river was not then being navigated, only one or two boats came up the river. He saw one about 1874; it was a steamboat and he saw it as it was coming back, about 8 or 10 miles above the mouth of the Kiamichi. The river was then on a little rise. One boat sank at Slate Shoals. He knew of no other boats except gasoline boats that were used in the timber business; they were used to bring supplies up the river for a period of fifteen years or so. Ash, cotton, and some walnut were floated down the river, which could not be moved in low water, but when the water was high enough, the rafters would turn it loose. The timber was put into rafts and fastened together; this logging continued for ten or fifteen years until the timber was all cut out. The first raft was taken to Fulton, Arkansas. The timber was taken from above the mouth of the Boggy, which is 30 or 35 miles above the mouth of the Kiamichi; the rafting continued throughout all the year at any time a little rise would take it down. The last rafting he saw occurred about 12 years ago. Not all the commercial timber in this county was rafted down the river; some mills were set up there, though the

handle factory is continuing to cut out ash timber and take it down the river.

G. W. Oaks (R. 1575), Hugo, Okla., 70 years old, testified that as a boy he saw a steamboat loading cotton at his grandfather's gin. He remembers the old Pine Bluff landing. There were several points along the river where boats landed. Thinks steamboats went up and down the river until along in the seventies. One he recalled was blown up about at Slate Shoals. Sawlogs were rafted down the river.

L. W. Oaks (R. 1578), Frogville, Okla., 1½ miles from Red River, 64 years old, testified that there used to be little boats running up and down the river which carried out cotton and products of the country before the coming of the railroads; they brought in dry goods and groceries and things of that sort from Shreveport and New Orleans; there were various landings up and down the river where there were stores that got these things from steamboats. Prior to the coming of the railroads one of the ordinary means of obtaining supplies and shipping out products of the country was the shipment of goods up and down Red River. Rafting logs continued off and on as long as there was merchantable timber in the country.

W. H. Pearcy (R. 1570), 76 years old, address Grant, Choctaw County, Okla. Timber was rafted in large rafts to Arthur City from the Boggy and up the river above there. When the river was low they would send small rafts; the size of the raft depended upon the stage of the water.

W. J. Oaks (R. 1581), 72 years old, residing at Grant, Choctaw County, Oklahoma, stated that before the railroad was built to Paris, Texas, some little boats came up Red River. In 1874 and 75 the boats brought salt, tobacco, molasses, and liquor to the mouth of Kiamichi, and peddled them to the citizens, carrying cotton back to New Orleans. The boats principally came to the mouth of the Kiamichi, but have gone above there. They have come as high as Arthur City.

Q. Herndon (R. 1584), McCurtain County, Okla., 60 years old, testified that walnut timber was rafted down the river in good sized rafts when he first went there. He saw two steamboats on the river; the last one in 1914. It was a Government dredge boat. There was a steamboat landing at old Albion, but he never saw any steamboats land there. Old Rowland was an old steamboat landing, and so was Briley's landing.

Garrett Igo (R. 1587), 80 years old, lived in country since 1848, when he came to Red River County, Texas, testified that he navigated Red River from 1866 to 1874. He was Captain of the *Belle Crook*, which was in 1866. He was on the *J. L. Briley* in 1872 and 1873. He made a trip or two on the *R. T. Briley* which was put on in 1876. These boats ran from Fulton, Arkansas, to the mouth of the Kiamichi, which was then considered the head of navigation. They were nearly all stern-wheel boats, drawing about four feet of water, and carrying 1,000 bales of

cotton. They were nearly all flat-bottom boats. There were a number of other boats on the river during that time. They generally ran from January up until April. About half a bank stage was required to run a boat. When the boats were not in use they were tied up either at Fulton or New Orleans. The boats would go through to New Orleans one or twice in a season.

Keel boats were used in navigation before the invention of steamboats. They drew about 3 feet of water. The *Ham Howell* and the *R. T. Briley*, the *Bonnie Lee*, and the *Royal George* ran after the Civil War. He remembered Ben Kuntz and John Kuntz. The boats were called the Kuntz lines. The *Era* and the *New Era* both ran before the Civil War. The Kuntz line and the Morgan line ran up and down upper Red River; they had a number of boats running on upper Red River along in this section of the country. He remembered a boat called the *Red River Planter;* it ran on the river in this section of the country.

Captain Cheatham ran the *Frontier;* he had a salt works up in the Kiamichi River and ran another boat called the *Southern*. He remembered a boat called the *Francis Jones*, and the *R. M. Jones* and the *Walla Busha*. The Jones boat was built to haul cotton off of the old Shawneetown farm. He remembered a boat called the *Jim Turner*. People living along Red River in those days marketed their crops from October until along in the spring. During the summer months there was nothing up

here for boats to haul out. During the fall and spring when there was anything to ship out, and the river was at the correct stage, the boats would come up and take it out. The boats brought merchants' goods to Clarksville, Sherman, and Honey Grove. Passengers came on those boats. Except for conveyance by wagon from Shreveport and Gaines Landing, the navigation of the Red River by boat was the only means of commerce for this section of the country. He remembered a steamboat by the name of the *Oliver* that ran to Clarksville, Texas. Fort Townson is just a little east of the Kiamichi River. Boats sometimes went a mile up the Kiamichi River to get cotton.

W. T. Graham (R. 1596). He had been on boats and had gone up to old Captain Wright's place at a rock landing just above the mouth of the Kiamichi. He knew of no whisky boats that came up the river except the little stern-wheel boats that would have a regular bar on them. These boats carried meat, flour, sugar, and coffee, selling supplies to the people along the river, and carried cotton back; they would bring in supplies to the people and carry back the produce of the country.

Isaac Johnson (R. 1597), 62 years old, lives 6 miles south of Idabel, Okla., testified that he saw boats on Red River since he had lived there (25 years); they used to come up Red River every winter after the rainy season set in, until the Texas & Pacific Railroad was built; he did not recall exactly what year that railroad was built, but since that

time the boats had not run regularly on the river. His house is right on the river in a bend, and he could see up and down the river for miles. The last boat he remembered was about 100 ft. long and 30 ft. wide, an oil burner he thinks, brought from St. Louis by a factory in Paris, Texas. It was a flat-bottom boat and ran in 1909. He saw it coming from St. Louis and afterwards saw it going back down the river, and again saw it going back up the river. He did not know what became of the boat; it was used by the timber people in rafting timber down the river; ash timber was put on it by the handle factory which owned it.

The boating season would last during December, January, February, March, and April.

Brewer-Elliott Oil & Gas Co. v. *United States*
(260 U. S. 77)

The findings of the District Court and Circuit Court of Appeals respecting the subject of navigability were approved by the Supreme Court.

In the report of the decision of the District Court (249 Fed. 609) at page 619 et seq. the Court sets out the substance of the evidence.

In the early days stern-wheel boats were used. A picture of the "*Aunt Sallie*," taken July 4, 1878, at Arkansas City, was exhibited. 365 persons were aboard at that time. The boat drew 2 ft. of water loaded.

W. M. Murdock stated that about 1870, one Walton built a flat boat at Arkansas City and put a

saw mill engine on it and some kind of a wheel and started for Wichita. A number of boats were built in the early days to haul lumber down to Arkansas City, then the end of the railroad.

R. E. Cook was acquainted with the river about 20 years. He once owned a small boat called the *"Carrie Clyde"* which drew 16″ to 18″ light and 24″ to 30″ when loaded. He brought it up about 20 miles above the Grand. The boat got out of the channel and was abandoned on the return trip after the load was removed. *"The City of Muskogee,"* another boat, was brought from Cincinnati to Muskogee. Several trips were made in a boat called the *"Mary D"* from Muskogee to Redland, a railroad point above Ft. Smith. The draft was 16″ to 18″ light and did not exceed 36″ when loaded. Never went above the mouth of Grand River. *"The City of Muskogee"* was somewhat larger than the *"Mary D"* and drew a little more water.

The following are excerpts from the opinion of the District Judge on final hearings (See Transcript of Record on file in Clerk's office pp. 788 et seq.):

A boat called *City of Muskogee* was used for excursion purposes.

A boat of 90 to 100 tons drawing 24 inches of water could travel to stretch from Webber Falls to Grand River almost any time.

Ferryman at Tulsa employed boats moved by poles or by wire and pulleys in high water, but steam and gasoline could only be used at high water.

Another ferry was located about one-fourth mile below (Tulsa) and two near the mouth of the Cimarron River.

The craft at Tulsa consisted of skiffs, gasoline launches, and a few houseboats.

A miller and stockman, near the disputed portions of the river, built a boat 9 by 43, six horsepower, drawing 12 or 14 inches, and used it for the purpose of hauling hogs, gun stocks, and wheat to Tulsa, a distance of 50 to 65 miles, and returned with merchandise. The venture proved unsuccessful and the boat was sold for a ferry.

Another resident of Cleveland rafted logs two miles to a mill and ran a ferry and other small boats, with fair success when the river was up and at ordinary stage by keeping the channel and occasionally pulling off sand bars.

United States v. *Holt State Bank* (270 U. S. 49)

Chris Saastad, witness for the Government, first saw Mud Lake the latter part of June, 1892, when he crossed it in a small, flat-bottom boat. In crossing, the boat was rowed in places and it was necessary to pole it in others. In one place in particular the oars struck and it was necessary to pole the boat to get across. There appeared to be a kind of bar in this section. The route followed was up Thief River into Mud River and then into Mud Lake, and up the river west of the lake. He saw the lake nearly every year since. He was on the lake in various years since 1892; crossed both ways.

In the fall of the year the lake abounded in wild ducks and geese, and was a favorite hunting ground, the hunters using boats to get to the islands. During the years, many settlers came in and went through, using the river to get in and then crossing the lake. Langley, who had a store up there, used the river and Mud Lake when open.

John Knutson was 30 years in the vicinity and knew the lake since about 1892. Frequently crossed the lake, small boats being used. In the early years used oars mostly, but later weeds and grass grew up and it was necessary to pole in many places. He frequently took hunters out on the lake in his boat and also did some trapping. Practically all of the settlers in the locality had boats. He saw gasoline boats coming up there, but they could not use them for the weeds. George Williams, of Thief River Falls, took one launch out there for the last couple of years before the dredge went there but he could not do anything with it because his rudder got full of weeds first few rods he made. Arpin had a boat up there in 1909. He said the boat was too big and was never on the lake before the ditch was put in there. The boat pulled the coal barges for the dredge and was used on Thief River to haul coal to the dredge. The lake was drained in 1910.

John Gabrielson came to the country in 1904. He rowed up Thief River into Mud Lake. The lake was tapped in 1910. In that year he made 2 or 3 trips in the launch from Thief River to Grygla in the spring of the year, and then the water went

down and he could not go any more. When he started out there was so much water in that part of the country that he did not stop for anything.

Chris Norbeck came up there in 1903. He saw Mud Lake from 1904 to 1910, when it was drained. There was always a little more water in the spring of the year. He used to cross the lake often in a boat. He went down Mud River, crossed the north side of the lake into Thief River and went down Thief River.

William J. LaBree has lived at Thief River Falls for 40 years. In 1893 or 1894 he visited the lake; found plenty of water. It was a high year. He took a flat-bottom boat from Thief River to Holt and went across the lake.

Michael Sorem went to the lake hunting and crossed it frequently. He stated that it was very fair rowing but had to push the boat ahead at times.

Tom C. Severson knew the river since 1895 and used boats for shooting.

Two other witnesses testified that they had used rowboats crossing and hunting upon the lake.

Fladeland, witness for the defendant, knew the lake since 1899. He was engaged in general merchandise business for years. He traveled from Thief River to Grygla by boat, made the trip five times and had goods brought up that way. Used rowboats and also gasoline launch. In 1900 shipped in supplies and merchandise. Had channel cut 200 rods, 6 or 8 feet wide through the peat so as to navi-

gate the boats. Some rowboats, some gasoline boats. His brother-in-law built a boat 22 feet long which carried 2,500 or 3,000 lbs. merchandise. He himself had a rowboat which would carry 2,500 lbs. He ran a gasoline launch all the way through. He saw Brown and Johnson up there in 1900 with a boat 25 or 30 feet long.

Milton Forder knew the country about 25 years. He went up Mud Lake hunting and crossed the lake in a rowboat. He built a flat boat to carry freight from Thief River Falls to settlers. The heaviest load he carried was 8,000 lbs. He used the lake to get in and out of the country in the summer.

Peterson, witness for the defense, used boat for hunting on the lake a good many times, also while camping there.

Oscar Langlie kept store at Liner from 1898 to 1905. He transported household goods by boat from Liner. He came up Thief River through Mud Creek into the lake and up Mud River using a rowboat.

Four other witnesses testified that rowboats were used by settlers generally, many of the flat-bottom type.

Harrison v. *Fite* (148 Fed. 781)

A gasoline boat, Government inspected, 38 feet long, 7 feet wide, 5 feet wheel, freight capacity 4 to 5 tons; drawing from 1 to 2 feet of water was operated for a period of three years by a merchant

who maintained wild game trading stations on various points on Little River. (R. 448, 449.)

For many years a licensed pilot operated steamboats on Little River, the largest of which was 84 tons, which drew 3 feet not loaded and up to 5 feet loaded. (R. 512.)

Lumber rafts were frequently operated. (R. 515.)

Boats were used for transporting cotton seed, wagons, etc. (R. 522.)

Lumber rafts containing thirty-five to forty thousand feet of lumber. (R. 555.)

Another boat of 19 tons capacity, Government inspected, drawing 2 feet of water. (R. 600.)

In the years 1891 and 1892 one witness brought down two lumber rafts containing 60,000 feet and 90,000 feet of lumber, respectively. (R. 621.)

In the years 1893 and 1894 a witness operated a steamboat commercially, the size not given. (R. 638.)

Between the years 1881 and 1883, a witness operated three flatboats. The first, 60 feet long and 12 feet wide and the top deck 17 feet wide. The second boat, 9 feet wide and 39 feet long. The third boat, 9 feet wide and 30 feet long. Two of the boats were operated by horsepower and the other by man power. (R. 644.) The boats were used for carrying stock and for the carriage of freight. (R. 650.)

Another witness operated a boat of 5 or 6 tons capacity (R. 659) which was used for transporting merchandise on the river (R. 661).

In addition to the other boats, numerous hunting skiffs, dugouts, and lumber rafts were operated from time to time on Little River.

Toledo Liberal Shooting Company v. *Erie Shooting Club*
(90 Fed. 680)

The case involved the navigation of certain water designated on the map as Maumee Bay. The following was the character of the boats used for commercial fishing on the water in question:

Boats twenty to twenty-four feet long; five to seven feet wide, carrying two sails; drawing about four inches of water. (R. 116.)

The part of the Bay in question was habitually used by commercial fishermen and the fishermen used various types of rowboats, sailboats, and power boats. (R. 145, 153, 174, 182.)

The Bay was also used by pleasure fishing boats. (R. 107, 433.)

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